

COMPUTER SPACE INSTRUCTIONS

1. Check for shipping damage.
2. Check that wires are firmly connected to the TV (see diagram on trouble-shooting guide) and that the grey power plug is connected to the TV circuit board.
3. Plug in the unit and defeat the interlock. (CAUTION: The back of the TV has high voltages.) The panel lights should come on, and after a brief warm-up time the TV screen should show starlit space with two flying saucers moving about.
4. TV Adjustments. The unit has been factory-adjusted but some TV control adjustments may be necessary due to changes caused by vibration in transit. Remember that this is a normal G. E. portable television and is no harder to adjust than any home receiver.

Volume on/off is located on the lower right front of the TV, accessible from the back door with some difficulty. Sound (beeps, missile scream, rocket thrust, and explosions) is on only during game play.

Brightness control is located on the lower center front of the TV and should be adjusted so the background is black and stars and saucers are bright (use a hand mirror to observe results).

Contrast control is located on the lower left front of the TV and should be adjusted for desired star brightness.

Horizontal hold is a white nylon knob on the back of the set at the right. To adjust it, turn on the test pattern switch on the computer box. If diagonal bars are seen, adjust until lock is obtained (the wider the bars are the closer to lock you are). Once in lock, adjust the hook (distortion) out of the top of the TV screen.

Vertical hold is the center long black knob on the back of the TV set and locks the picture from a vertical roll; it can also be used for up/down adjustment.

Vertical size (short knob to right of vertical hold) and vertical lin (short knob to left of vertical hold): These two knobs should be adjusted to make a checker-board pattern of test squares of equal size on all parts of the TV screen.

Once the set is properly adjusted while at operating temperature it should not require further adjustment until the tubes have weakened 75%, a period of time calculated to be about 2 years.

5. Cabinet care. The color is part of the fiberglass and can be restored to new condition through the use of soap and water. Deep scratches may be rubbed out with an abrasive cleanser or fine wet sandpaper. Major repair to the fiberglass may be made with a repair kit sold in most auto shops and Sears stores; Nutting Associates also stocks these repair kits. Major repair seems an unlikely prospect, however, due to the strength and resilience of fiberglass, stronger than wood in both cases.

6. TV maintenance. As a matter of routine, the TV should be removed once a year for screen cleaning. The TV is most easily removed by taking out the four screws connecting the metal brackets to the cabinet back, springing in the brackets and lifting the set out.

7. Brain (computer) unit. The brain unit has three option switches and a time adjustment control which can be changed using a flat blade screwdriver. Because of the extremely high reliability of integrated circuits the brain unit should be considered the least likely source of malfunction in all instances.

GAME OPERATION

Attract mode: Two saucers fly in formation on a star-filled background; sound is off.

Game on: Saucers begin to fire missiles and a rocket image appears. The rocket is equipped with a missile which may be guided after firing using the rotate controls.

Extended play mode: The background becomes white with black numbers, saucers and stars and a black border around the screen. Extended play is awarded if the rocket has made more hits than the saucers at the end of the time limit or if the saucer resets itself.

OPERATING SUGGESTIONS

For hostile locations, space is provided in the bottom of the cabinet for additional weight. Lighter color cabinets (yellow) do slightly better in dark bar type locations, while metalflake colors are better for arcade and well lit spots. If excessive vibration occurs it may become necessary to tape the controls of the TV to keep them from drifting out of adjustment. In no instance has 2/25¢ play increased receipts in test locations.

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It was our object in Computer Space to design an amusement machine which would appeal to adults as well as children. From collection reports around the country we have exceeded our expectations. It was also our object to create a new standard of reliability using the latest technology. We believe that this goal has been met also. Computer Space requires operators to have no more fear of replacing a bad tube than of replacing a bad relay.

If I can help answer any question concerning this machine, please do not hesitate to call me personally.

Nolan K. Bushnell
Chief Engineer
NUTTING ASSOCIATES, Inc.
(415) 961-9373

1. TEST PATTERN ON

- Adjust out top hook
- Vertical centering and size

2. TEST PATTERN OFF, EXTENDED PLAY YES, 2/25¢ YES.

- Brightness just below background illumination
- Contrast for small bright stars
- Volume full
- Tape control knobs

3. REWORK COIN CHUTE.

- Check panel for tight fit
- Run quarter through rejector with plunger depressed several times
- Run coin through and start game; note coin counter
- Check that second game is free

4. INSPECT TO MAKE SURE:

- Wires are tight
- TV bracket is tight
- TV card is taped in
- TV has adequate clearance
- Final settings are:
 - Game time 1.5 min
 - 2/25¢ play NO
 - Test pattern OFF
 - Extended play YES

5. CHECK THAT THE FOLLOWING ARE INCLUDED:

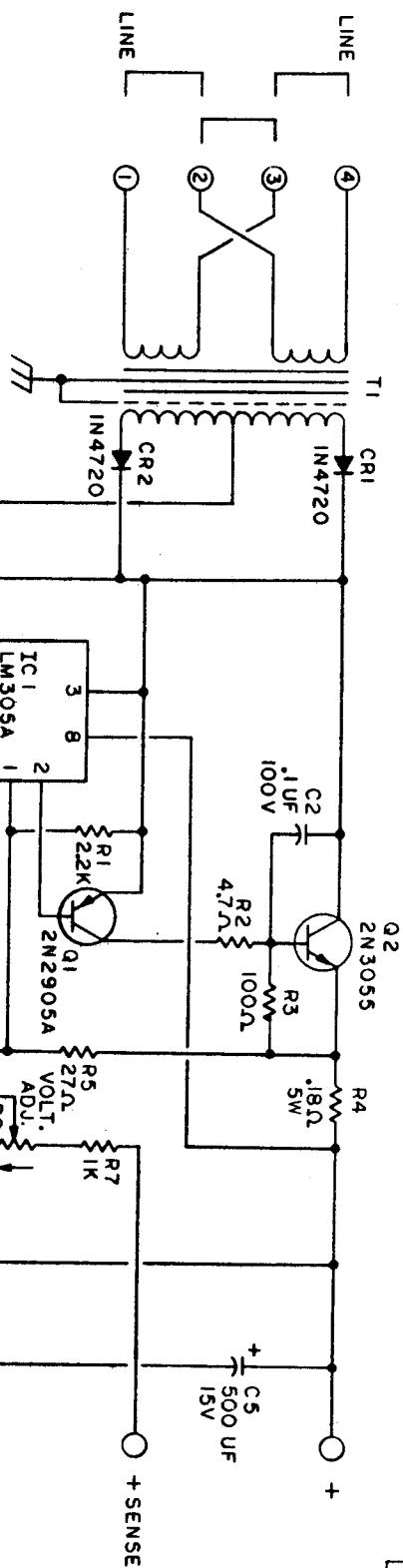
- GE insert
- Trouble-shooting guide
- Instruction sheet

Serial numbers _____
(unit-tube-brain box) (color)

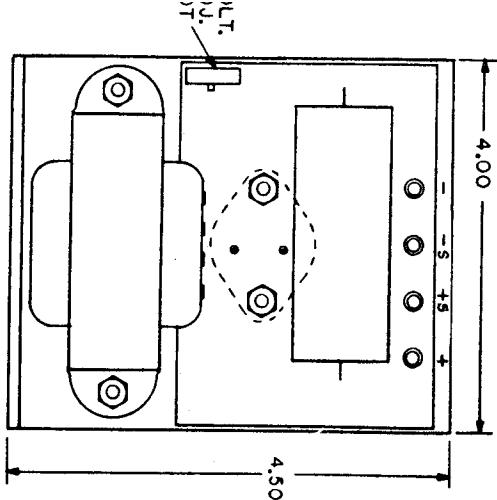
Date _____

Inspected by _____

NOTE: Please write remarks or comments on back of this sheet.



OUTLINE AND MOUNTING DIMENSIONS



CAUTION : READ NOTES BELOW BEFORE OPERATING

1. FOR 120V OPERATION JUMPER 1 TO 2 AND 3 TO 4 ON TI ; FOR 240V OPERATION JUMPER 2 TO 3. APPLY LINE POWER TO 1 AND 4
2. POWER SUPPLY DESIGN ALLOWS FOR CONTINUOUS OPERATION UNDER FULL LOAD AND HIGH LINE CONDITIONS AT 55°C AMBIENT IN FREE AIR ENVIRONMENT. IF AIR FLOW IS RESTRICTED, THE CASE TEMP. OF 2N3055 TRANSISTOR ON HEAT SINK SHOULD BE MONITORED UNDER PARTICULAR WORST CASE CONDITION. MAXIMUM ALLOWABLE TEMP. IS 155°C
3. CROWBAR FACTORY ADJUSTED AT 6V
4. CAUTION : IF REMOTE SENSING IS NOT DESIRED CONNECT JUMPER BETWEEN + AND + SENSE AND - AND - SENSE TERMINALS. IF REMOTE SENSING IS DESIRED DO NOT INSTALL JUMPERS, BUT CONNECT + SENSE TO + AT LOAD END OF LINE, AND - SENSE TO - AT LOAD END OF LINE.
5. RECOMMENDED EXTERNAL FUSING : .5A FOR 120V OPERATION .25A FOR 240V OPERATION

SPECIFICATIONS

LOAD REGULATION : .1% (0 TO FULL LOAD)

LINE REGULATION : .1% FOR 120/240 \pm 10% (SEE NOTE 1)

NOISE AND RIPPLE : .1% OVERVOLTAGE PROTECTION AVAILABLE (SEE NOTE 3)

REMOTE SENSING (SEE NOTE 4)
OPERATING TEMP. : 0 - 55°C (SEE NOTE 2)

ELEXON INC.	
SANTA ANA, CALIF.	
SCALE	APPROVED BY
DATE 2-25-77	DRAWN BY L.K.
	REVISED

POWER SUPPLY 5V, 3A

MODEL OLV 15-5

PRE-INSTALLATION INSPECTION FOR ONE- OR TWO-PLAYER COMPUTER SPACE

1. Check for loose, broken or missing components. Correct if these conditions exist before proceeding further.
2. Check door interlock switch for proper operation.
3. Apply power to unit and check +5VDC power supply for proper voltage level. To insure proper operation of unit the DC voltage level should be set at +5V(± 0.2V)DC.
4. Check whether instruction lights are on. If not, replace lamp(s).
5. Actuate coin switch to check coin counter for proper operation. If coin counter does not advance, check trouble-shooting guide.
6. Apply test pattern to TV and check TV for horizontal and vertical linearity. Adjust if required.
7. Check TV for proper contrast and brightness. Adjust if required.
8. Press start game switch and check operation of unit in single-player mode for proper operation. If not, see trouble-shooting guide.
9. Actuate coin switch again, press two-player select button, then press game start switch. Check unit in two-player mode for proper operation. In this mode of operation at the count of 99 the game should switch to standby operation, which is single-player operation. If not, see trouble-shooting guide.

TWO-PLAYER COMPUTER SPACE TROUBLE-SHOOTING GUIDE

Nutting Associates' Two-Player Computer Space game has been designed for easy servicing by using modular assemblies rather than requiring the repair of discrete components. Servicing is done by "removing and replacing" and does not require a technician trained in electronics.

Computer Space Two-Player is made up essentially of five sub-assemblies: TV set, power supply, computer (brain box), joystick control board (mounted on front panel) and control panel. This is the order in which trouble-shooting should be conducted.

First check the TV adjustments in accordance with numbers 6 and 7 of the preinstallation instructions which came with the game. Once the TV set is properly adjusted it is much easier to check the other components.

Secondly, the power supply should be checked under full load when connected to the computer. The output voltage should be 4.8 to 5.2 volts DC. If it has an AC component or is low in voltage, the power supply should be replaced. Do not attempt power supply repairs; an improperly serviced power supply could damage the computer and cause expensive repairs.

In checking the computer, first check the connections between the printed circuit boards and their respective connectors to make sure that the PC boards are seated properly in the connectors. The PC boards are checked next to see that they have not slipped out of the plastic guides on the computer frame and are not touching each other or the metal frame.

If all the above checks out, then the problem probably centers in the computer. We have designed the computer to be serviced by simply removing the faulty PC board and replacing it with a good board. The faulty board is sent back to the factory for exchange. Exchange repairs are charged only on the basis of necessary repairs, and not for the whole board. When the faulty board is returned it will assist us in repairing it if the failure mode is written on a piece of tape or tag and affixed to the board. If you are unable to isolate the problem, then we recommend that the complete computer be returned to the factory for exchange.

TWO-PLAYER COMPUTER SPACE -- Some Typical Failure Symptoms

Sync Star Board

Purpose: To generate horizontal and vertical scan and sync, generate stars, scoring and time, and control start and stop game functions, explosions.

Typical failure symptoms:

- No or improper timing, count or score
- No game start or continuous game
- No extended play in one-player mode
- No horizontal or vertical hold
- Bad stars
- No collision or missile hits
- Improper explosion sequence
- No two-player mode
- Extended play in two-player mode

Motion Board

Purpose: To generate saucer motion, saucer missile motion and image, saucer direction control, player 1 rocket motion, player 1 rocket missile motion and image, player 2 rocket motion, player 2 rocket missile motion and image, determination of 1 or 2 player operation.

Typical failure symptoms:

- Jerky, excessively fast or jumpy motion of any object
- No images at all
- Missile always in flight
- Distorted rocket image
- No two-player mode
- No one-player mode

A-Memory Board

Purpose: To generate player 1's rocket image, saucer image, rocket rotation, sound generation, +12VDC for sound circuitry, rocket missile directional control, rocket thrust indication, rocket speed command generation, rocket directional control, end of game command.

Typical failure symptoms:

- Odd-shaped rocket or saucer
- Erratic rocket rotation
- No or distorted sound
- Unpredictable rocket missile flight
- Incorrect rocket thrust control
- Continuous game

B-Memory Board

Purpose: Player 2's rocket image generation, rocket rotation, rocket missile directional control, rocket thrust indication, rocket speed command generation, video circuitry, coin counter circuitry.

Typical failure symptoms:

- Odd-shaped rocket
- Erratic rocket rotation
- No or weak video
- Unpredictable rocket missile flight
- Incorrect rocket thrust control
- Coin counter does not advance

Joy Stick Board

Purpose: To generate thrust, rotation and hyperspace commands for each player position.

Typical failure symptoms:

- No thrust
- No rotation in either or both directions
- No hyperspace*

* Defined as the ability of the rocket to disappear.

+5V Power Supply

Purpose: To provide +5VDC to integrated circuits and video circuitry.

Typical failure symptoms: Weak video and any or all of the previously described failure symptoms.

+12VDC Power Supply, located on the A-Memory Board

Purpose: To provide +12VDC audio circuitry and coin counting circuitry.

Typical failure symptoms: No or weak audio and coin counter will not advance.

TWO-PLAYER COMPUTER SPACE
PLAYER CONTROLS

J1 = Sync
J2 = Motion
J3 = "A" Memory
J4 = "B" Memory
JS-2 = Joystick PC bd

<u>Key</u>	<u>Function</u>	<u>Board/Key</u>	<u>IC/Pin Number</u>
PLAYER 1:			
4 top 6	CW rotation (right)*	J3 17	F6-10, E6-5
3 top 4	CCW rotation (left)*	J3 18	E5-4, E6-6
A top 2	Thrust*	J3 20	F3-5, 10, 13, sound circuitry
	"Missile fire" switch	J2 5	G1-9, F1-9
PLAYER 2:			
13 top 8	CW rotation (right)*	J4 15	F6-10, E6-5
M bottom 11	CCW rotation (left)*	J4 16	E5-4, E6-6
10 top 10	Thrust*	J4 8	F3-5, 10, 13
	"Missile fire" switch	J2 6	F1-1, G1-12
	1 or 2 plays for a quarter	J1 8	B5-4
	Free game	J1 6	A4-4
	Start switch	J1 4 2	B6-13 N/O A6-1 N/C
	1- or 2-player select switch	J1 N P	A2-8 Diode Q10
	Coin microswitch	J1 7	Compac relay, C5-13

* JS-2 Joystick PC board.

TWO-PLAYER COMPUTER SPACE
J1 SYNC STAR BOARD OUTPUTS

J2 = Motion Board
J3 = "A" Memory Board
J4 = "B" Memory Board

Connector Key #	Output Key #	Function	To	Board # / Via Key # / To IC and Pin #
3	A5-6	Audio gate	same J2 J3	A6-2, B4-5 G3-9 R48, Base Q12
5	E4-11	Normal/Hyper space	J4	19 H3-2, 13, J2-2, 3
9	C2-12	Time units/50	same J3	B1-11, C5-11 A5-5
12	F6-3	Saucer out and B- rocket enable	same J3 J4	E6-5, 12 F4-9, C5-2, 10, 11 74151-7 E1-12
15	G6-10	<u>Hyper</u> space	same J4	H6-9, J6-9 Cathode of "stars" diode
16	H6-15	Normal space	same J4	G6-11 Anode of diode; normal space ckt
17	B6-3	<u>Hyper</u> numbers video out	same J4	G6-13 Cathode of No. diode
18	G6-12	<u>Normal</u> numbers video out	J4	Anode of diode; normal space ckt
20	G6-4	Clock out	J2	X F4-3, 5, 13
B	F2-2	Explosion	J3	Through 1K ohm to base Q6
C	C2-1	Time/10	same J3	B1-14, C1-11 A5-4
F	E4-8	Sync out	J4	27 Through 1K ohm to base Q7
H	D4-5	B- spin	J4	17 F6-13
J	E5-11	Normal missile video	same J4	C5-1 Anode of diode; normal space

Two-Player Computer Space
 J1 Sync Star Board Outputs
 Page 2

Connector Key #	Output	Function	To Board # / Via Key # / To IC and Pin #		
K	C5-2	<u>Hyper</u> video out	J4	22	Cathode of missile diode
L	D4-9	A- spin	same J3	19	E5-5 F6-13
N	A2-8	One or Two Player select sw			1- or 2-player select switch
P	1- or 2- player sw				Anode of diode connected to base Q10
R	Collector Q10		J2	25	J3-5
T	F6-8	Rocket enable*	same J3	14	E6-3, 6 Rocket enable
U	D3-14	Blanking out	same J4	18	E5-2, J6-10, F5-6, G5-4, Key V J3-1, H3-1
V	D3-14	Count enable	same J2	18	E5-2, J6-10, F5-6, G5-4, Key U E2-10, E3-10, E4-10, E5-10
W	E4-3	Test pattern out	S1		Test pattern swit
X	E2-1	Time units/2	same J3	K	C1-1, 12 A5-1
Y	E2-12	Time units/20	same J3	L	B1-1, 12 A5-2

* Enables rocket after the explosion.

TWO-PLAYER COMPUTER SPACE
J3 "A" MEMORY BOARD OUTPUTS

J1 = Sync Star Board
J2 = Motion Board
J4 = "B" Memory Board

Connector Key #	Output Key #	Function	To Board # / Via Key # / To IC and Pin #		
16	J2-1	Video out	J4	N	E5-1
24		Audio out, audio section		TV audio	
P	A5-6	1 or 2, literally, reset	J2	AA	G4-1
T	F5-4	Missile up/down enable	J2	8	F3-12, C3-3
U	F5-1	Missile left/right enable	J2	9	F3-9, E3-3
V	H5-11	2^1 , A-vertical velocity*	same		H6-4, 10
			J2	DD	H4-13
W	H5-6	2^0 , A-vertical velocity*	same		H6-2, 12
			J2	21	H4-3
X	H5-3	2^2 , A-vertical velocity*	same		H6-1, 13
			J2	22	H4-10
Y	H4-7	Up/down, A-vertical velocity	same		H5-1, 4, 13, H6-5,
			J2	W	H2-1
					F5-5
Z	J5-8	Missile up/down	same		H3-5, H2-13
			J2	10	F3-11
AA	J5-11	Up/down thrust, A-speed 2^1 *	same		J6-4, 10
			J2	19	J4-13
BB	J5-6	Up/down thrust, A-speed 2^0 *	same		J6-2, 12
			J2	20	J4-3
CC	J5-3	Up/down thrust, A-speed 2^2 *	same		J6-1, 13
			J2	23	J4-10
DD	J4-7	Right/left, A-horizontal velocity	same		J5-1, 4, 13, J6-5,
			J2	V	H2-3
					F5-3
EE	E3-14	Missile right/left	same		J3-5
			J2	11	F3-8

* Because of the different directions the rocket may take, left/right and up/down signals may appear at horizontal as well as vertical velocity circuits.

TWO-PLAYER COMPUTER SPACE
J4 "B" MEMORY BOARD OUTPUTS

J1 = Sync Star Board
 J2 = Motion Board
 J3 = "A" Memory Board

Connector Key #	Output	Function	To Board # / Via Key # / To IC and Pin #		
5	E1-13	Rocket video	same	6	C4-2
28	Emitter Q8	Video out thru 10 ohm resistor		TV Video	
P	E6-1	Rocket "B" turn sounds	J3	15	Audio section
T	F5-4	Missile "B" up/down enable	J2	1	A1-11
U	F5-1	Missile "B" right/left enable	J2	4	A1-2
V	H5-11	2^1 , B vertical velocity*	same		H6-4, 10
			J2	13	H5-13
W	H5-6	2^0 , B vertical velocity*	same		H6-2, 12
			J2	14	H5-3
X	H5-3	2^2 , B vertical velocity*	same		H6-1, 13
			J2	17	H5-10
Y	H4-7	B up/down	same		H5-1, 4, 13, H6-5
			J2	Z	H2-1
					G5-2
Z	J5-8	Missile up/down	same		H3-5, H2-13
			J2	3	A1-14
AA	J5-11	Up/down thrust, speed 2^1 , B*	same		J6-4, 10
			J2	EE	J5-13
BB	J5-6	Up/down thrust, speed 2^0 , B*	J2	15	J5-3
CC	J5-3	Up/down thrust, speed 2^2 , B*	same		J6-1, 13
			J2	16	J5-10
DD	J4-7	Right/left	same		J5-1, 4, 13, J6-5,
EE	E3-14	Missile right/left	J2		H2-3
			same	CC	G5-11
			J2	2	J3-5, E3-14
					A1-5

* Because of the different directions the rocket may take, left/right and up/down signals may appear at horizontal as well as vertical velocity circuits.

TWO-PLAYER COMPUTER SPACE
J2 MOTION BOARD OUTPUTS

J1 = Sync star board
J3 = "A" Memory board
J4 = "B" Memory board

Connector Key #	Output	Function	To Board # / Via Key # / To IC and Pin #		
7	B3-15	Rocket missile video	same		F3-2, 3
			J1	14	F6-5
12	A4-8	"A" rocket enable	same		J3-13
			J1	10	E6-9
24	J3-10	Sync	same		H1-4
			J1	13	F6-1
26	B2-15	B- missile video	same		J3-9
			J1	11	F6-13
27	H2-15	Saucer movement	same		G3-2, 5, J2-4, 10
			J4	R	J1-3, H2-6
			J3	S	F6-4
					F6-4
28*	G1-6 and F3-4	Missile sound out	J3	22	Audio section
B	D4-11	Vertical counts, "A" rocket enable	same		J1-6
			J3	D	A6-6, 11
C	D4-12	Vertical counts, "A" rocket enable	J3	E	B6-6, 11
D	D4-13	Vertical counts, "A" rocket enable	J3	8	C6-6, 11
E	D4-14	Vertical counts, "A" rocket enable	J3	13	D6-6, 11
F	D5-11	Vertical counts, "B" rocket enable	same		J1-8, E1-10
			J3	4	A6-3, 12
			J4	D	A6-6, 11
H	D5-12	Vertical counts, "B" rocket enable	J3	H	B6-3, 12, E6-12
			J4	8	B6-6, 11, E6-12
J	D5-14	Vertical counts, "B" rocket enable	J3	10	D6-3, 12
			J4	L	E4-11, J1-5

* See schematic; outputs are common, through appropriate circuitry, for missile sound output.

Two-Player Computer Space

J2 Motion Board Outputs

Page 2

Connector <u>Key #</u>	Output	Function	To Board # / Via Key # / To IC and Pin #		
K	D5-13	Vertical counts, "B" rocket enable	J3 J4	R J	C6-3, 12 C6-6, 11
L	E4-11	Horizontal counts, "A" rocket enable	same J3	C	J1-5 A6-5, 10
M	E4-12	Horizontal counts, "A" rocket enable	J3	J	B6-5, 10
N	E4-13	Horizontal counts, "A" rocket enable	J3	7	C6-5, 10, and through diode to 74151-15
P	E4-14	Horizontal counts, "A" rocket enable	J3	12	D6-5, 10
R	E5-11	Horizontal counts, "B" rocket enable	same J3 J4	5 C	J1-9 A6-4, 13 A6-5, 10
S	E5-12	Horizontal counts, "B" rocket enable	J3 J4	F 7	B6-4, 13 B6-5, 10
T	E5-14	Horizontal counts, "B" rocket enable	same J3 J4	11 14	H3-3 D6-4, 13 D6-5, 10
U	E5-13	Horizontal counts, "B" rocket enable	J3 J4	6 H	C6-4, 13 C6-6, 11
BB	G4-6	1 or 2, literally	same J1 J3 J4	D 21 9	G5-1, E1-1, A1-1 D5-5, 6 J3-2 H2-9

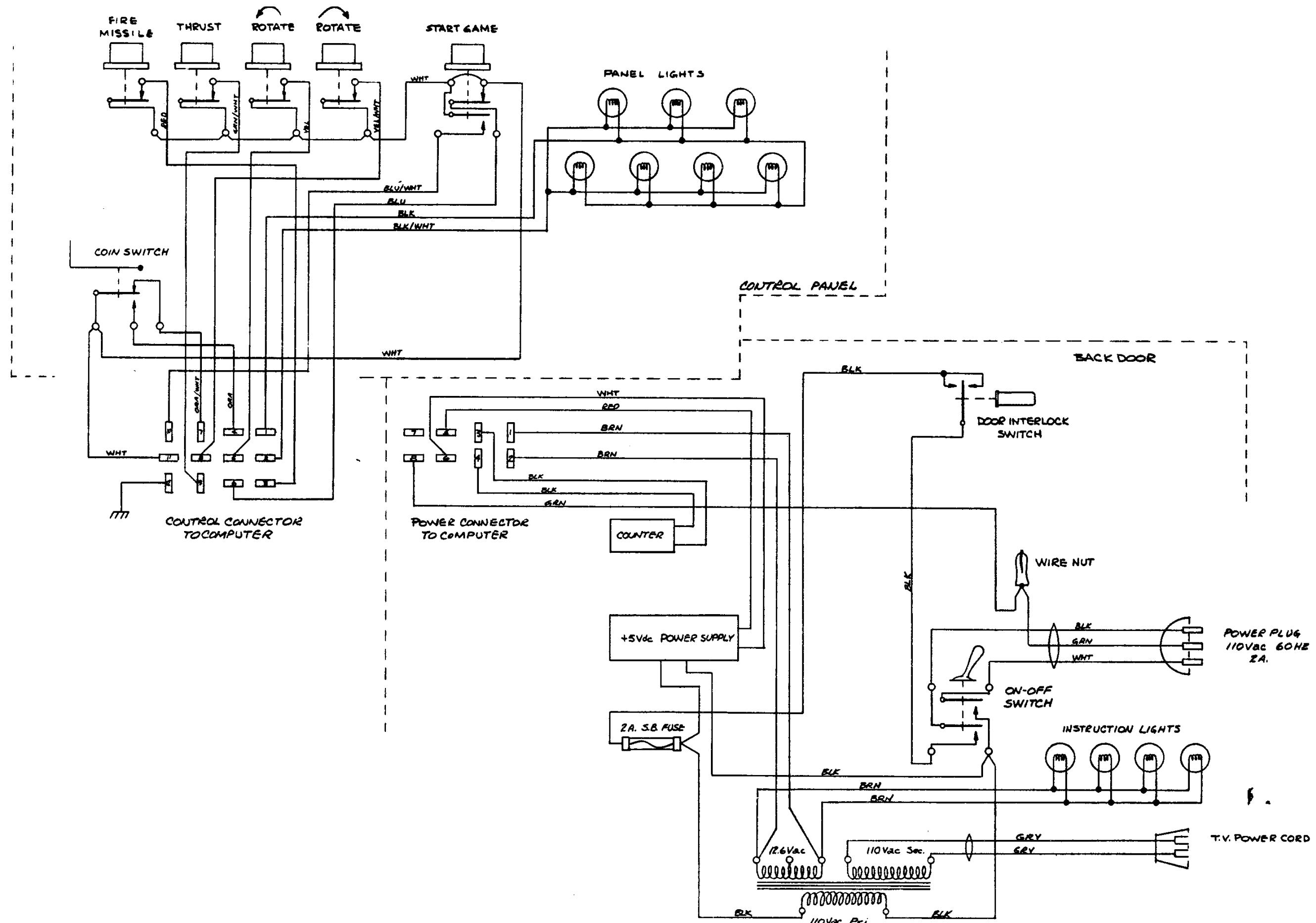
TWO - PLAYER CHASSIS WIRING

8-PIN MOLEX

<u>PIN</u>	<u>WIRE</u>	<u>PURPOSE</u>
1	Blk	12 vac
2	Blk	12 vac
3	Brn	coin counter
4	Brn	coin counter
5	Red	+5 VDC
6	Wht	common (signal)
7	NC	
8	NC	

24-PIN MOLEX FROM FRONT PANEL TO BRAIN BOX

<u>PIN</u>	<u>WIRE</u>	<u>PURPOSE</u>
1	NC	
2	NC	
3	Blk	Player 1 missle fire
4	Wht	NO side coin switch
5	Blu	Player 1 counter-clockwise rotation
6	Grn	NC side start game switch
7	Blk	NC side coin switch
8	Blk	Player 1 clockwise rotation
9	Blk	Player 1 thrust
10	Y1	NO side start game switch
11	NC	
12	NC	
13	NC	
14	NC	
15	Blk	Player 2 Clockwise rotation
16	Or	Player 2 counter-clockwise rotation
17	Red	Player 2 missle fire
18	Wht	Player 2 thrust
19	Red	Com side 2 player select switch
20	Grn	Common (signal)
21	Red	NO side 2 player select switch
22	Blu	+5 VDC
23	NC	
24	NC	



CONTROL & POWER CHASSIS WIRING,
COMPUTER SPACE
DRAWN BY TED DABNEY
NUTTING, ASSOC. MNT. VIEW, CALIF.

J1
POWER

1	J5-V J2-Y
2	J5-W J2-Z
① 3	J5-16
4	J5-19
5	J3-Z
6	J3-11 J5-3 J2-11 J5-1 S7-B
7	
8	J2-12

J2
CONTROL

1	J1-1
2	J1-2
3	J4-Y
4	J5-C
5	J3-N
6	J5-B
7	J5-21
8	J3-M
9	J3-S
10	J5-7
11	J1-6
12	J1-8

COUNTER CHANGE

J3
MEMORY

J1-6	1	A	J4-8
J4-K	2	B	J4-6
J4-F	3	C	J4-12
J4-N	4	D	J4-15
J4-13	5	E	J4-9
J4-L	6	F	J4-5
J4-E	7	H	J4-11
J4-M	8	J	J4-R
J4-14	9	K	J5-2
J5-5	10	L	
J4-B	11	M	J2-8
J4-18	12	N	J2-5
J4-D	13	P	J5-N
J4-3	14	R	J5-M
J4-4	15	S	J2-9
J4-J	16	T	J4-19
J4-16	17	U	J4-17
J4-2	18	V	J4-U
J5-K	19	W	J4-T
TV-AUD	20	X	J4-Y
J5-X	21	Y	J4-H
J5-L	22	Z	J1-5 J4-22

J4
MOTION

J3-1	1	→ A	J5-1
J3-18	2	B	J3-11
J3-14	3	C	J5-H
J3-15	4	D	J3-13
J3-F	5	E	J3-7
J3-B	6	F	J3-3
J3-H	7	H	J3-Y
J3-A	8	J	J3-16
J3-E	9	K	J3-2
J5-4	10	L	J3-6
J3-H	11	M	J3-8
J3-C	12	N	J3-4
J3-S	13	P	J5-6
J3-9	14	R	J3-J
J3-D	15	S	
J3-17	16	T	J3-W
J3-U	17	U	J3-V
J3-12	18	V	J3-X
J3-T	19	W	J5-E
J5-Y	20	X	
J5-3	21	Y	J2-3
J3-Z	22	→ Z	J5-22

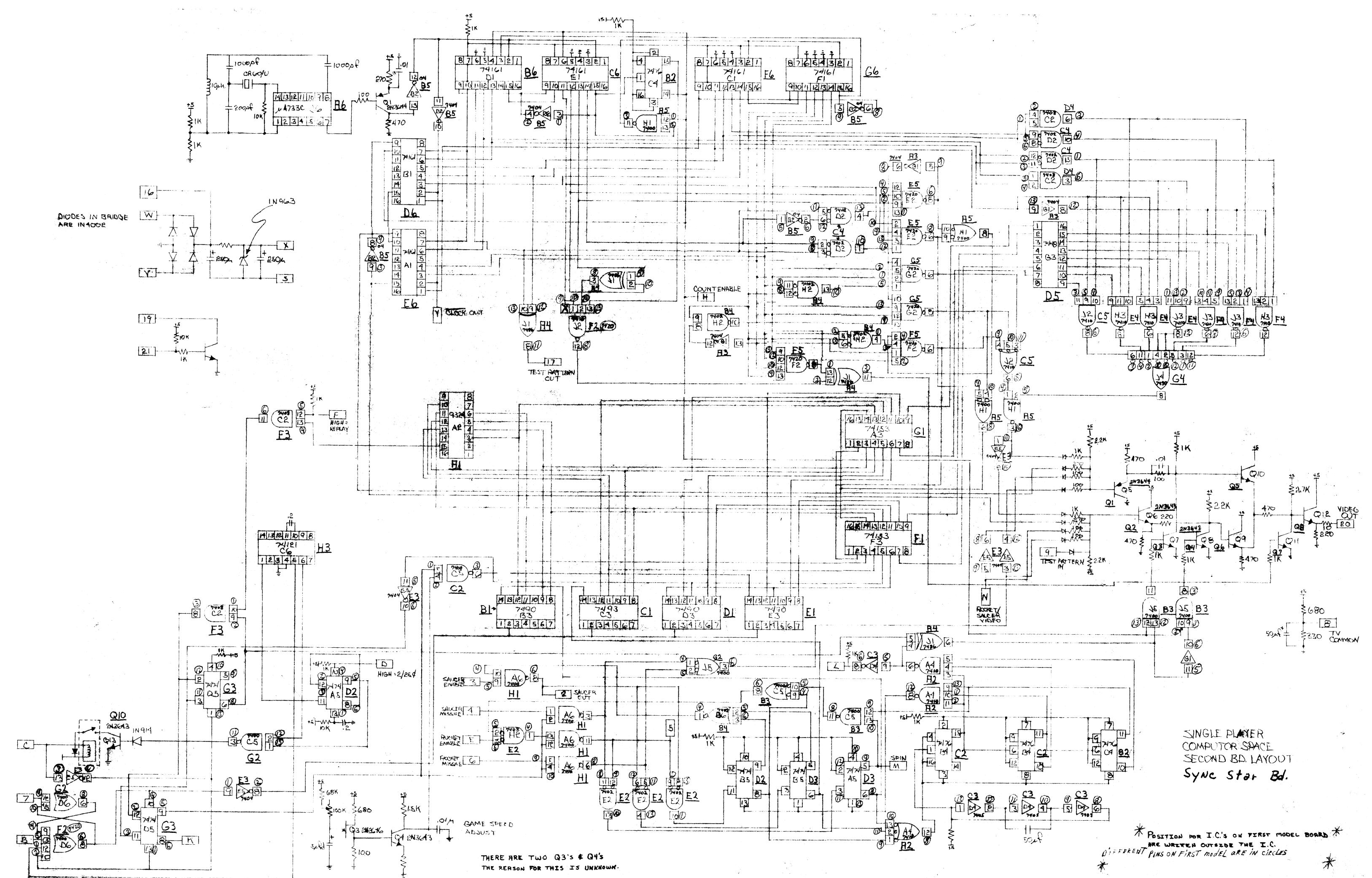
J5
SYNC

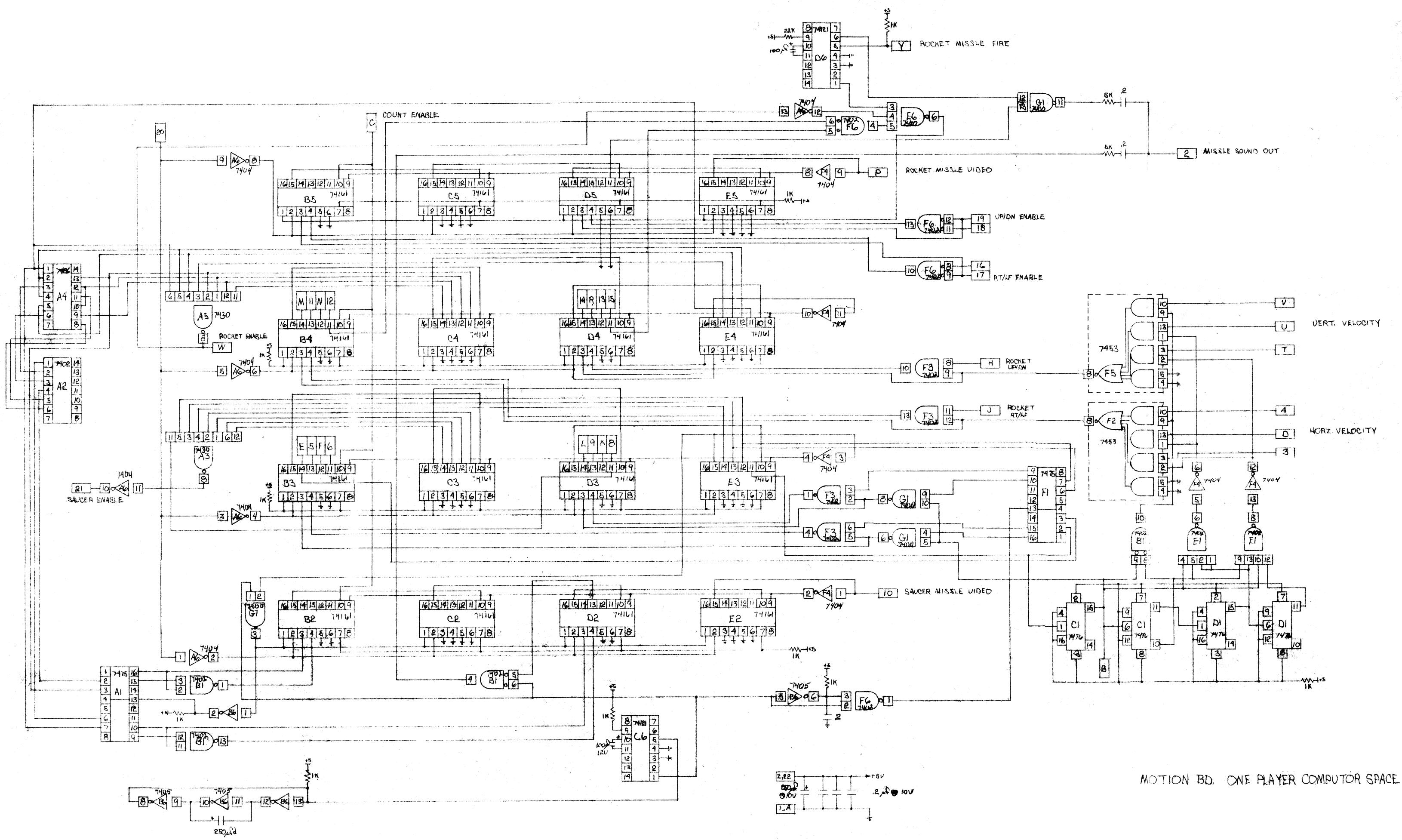
J4-A	1	→ A	J5-S
J3-K	2	B	J2-6
J4-21	3	C	J2-4
J4-10	4	D	S7-C
J3-10	5	E	J4-W
J4-P	6	F	S6-A
J2-10	7	H	J4-C
TV-COM	8	J	
S8-B	9	K	J3-19
10	L		J3-22
11	M		J3-R
12	N		J3-P
13	P		
14	R		
15	S		S7-B
① J1-3	16	T	
S8-A	17	U	
18	V		J1-1
J1-4	19	W	J1-2
TV-VID	20	X	J3-21
J2-7	21	Y	J4-20
J4-Z	22	→ Z	

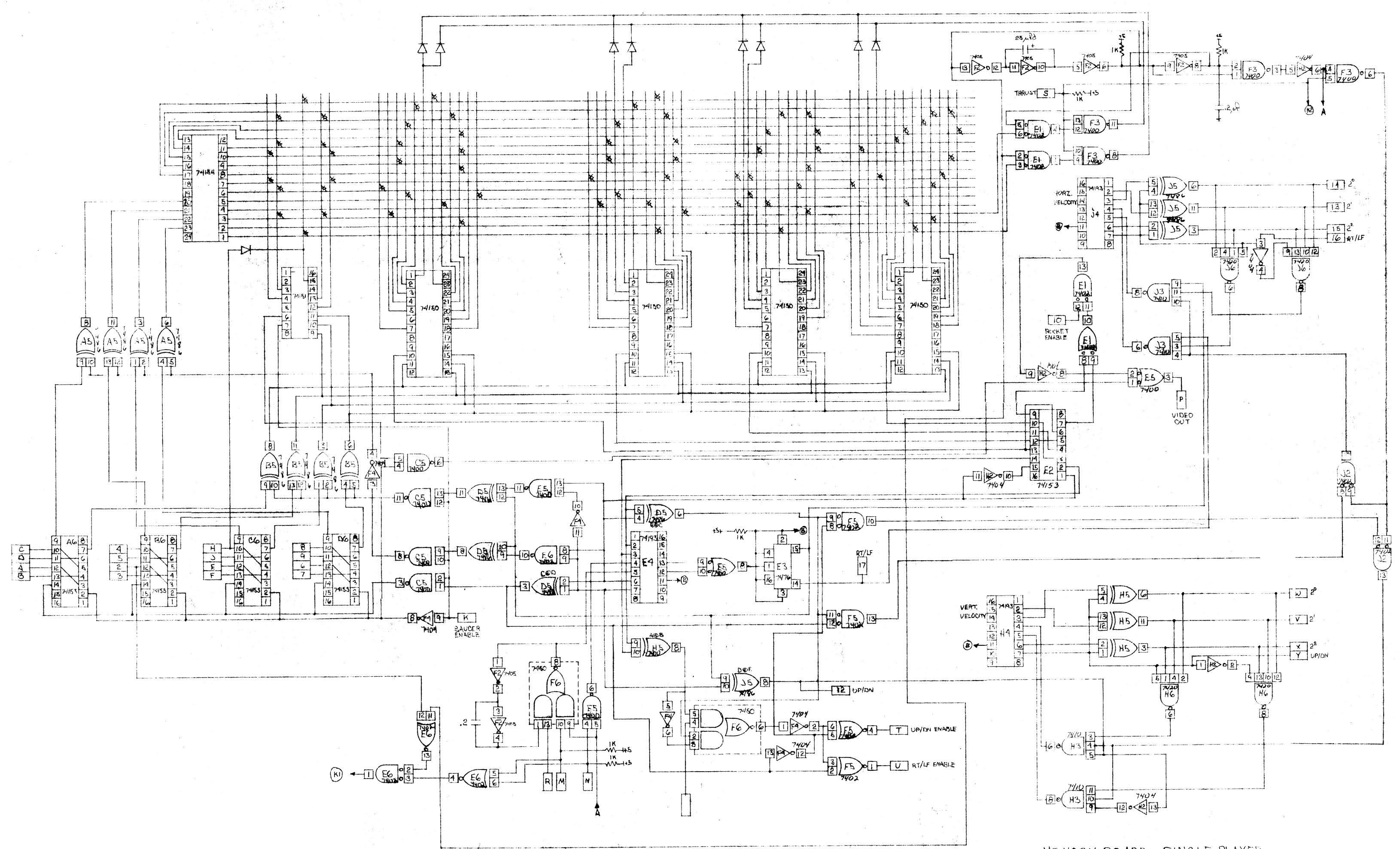
NA -

SINGLE PLAYER COMPUTER SPACE
CONNECTOR INTERCONNECTIONS

NOV 23, 1971 SKD -

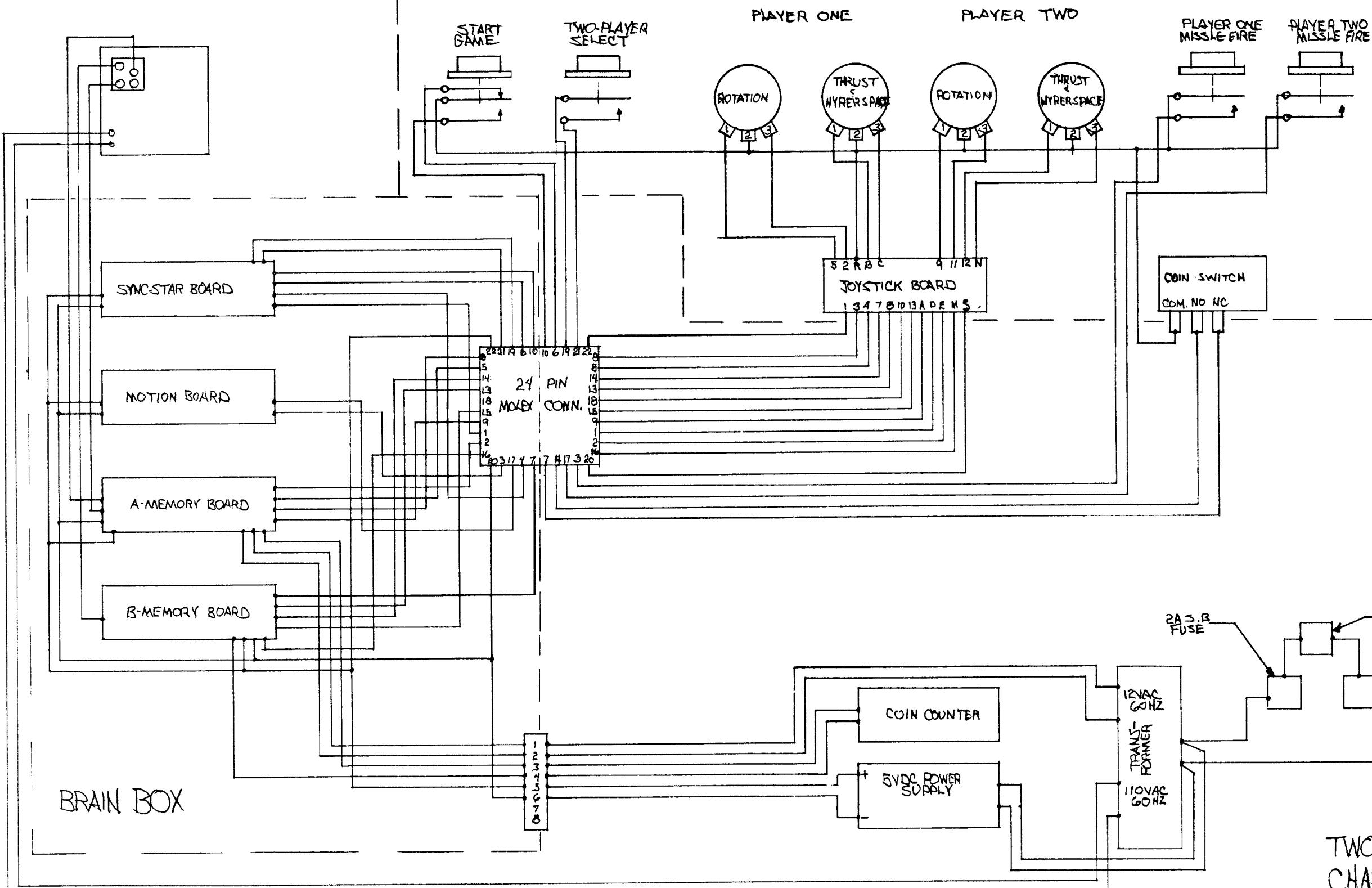






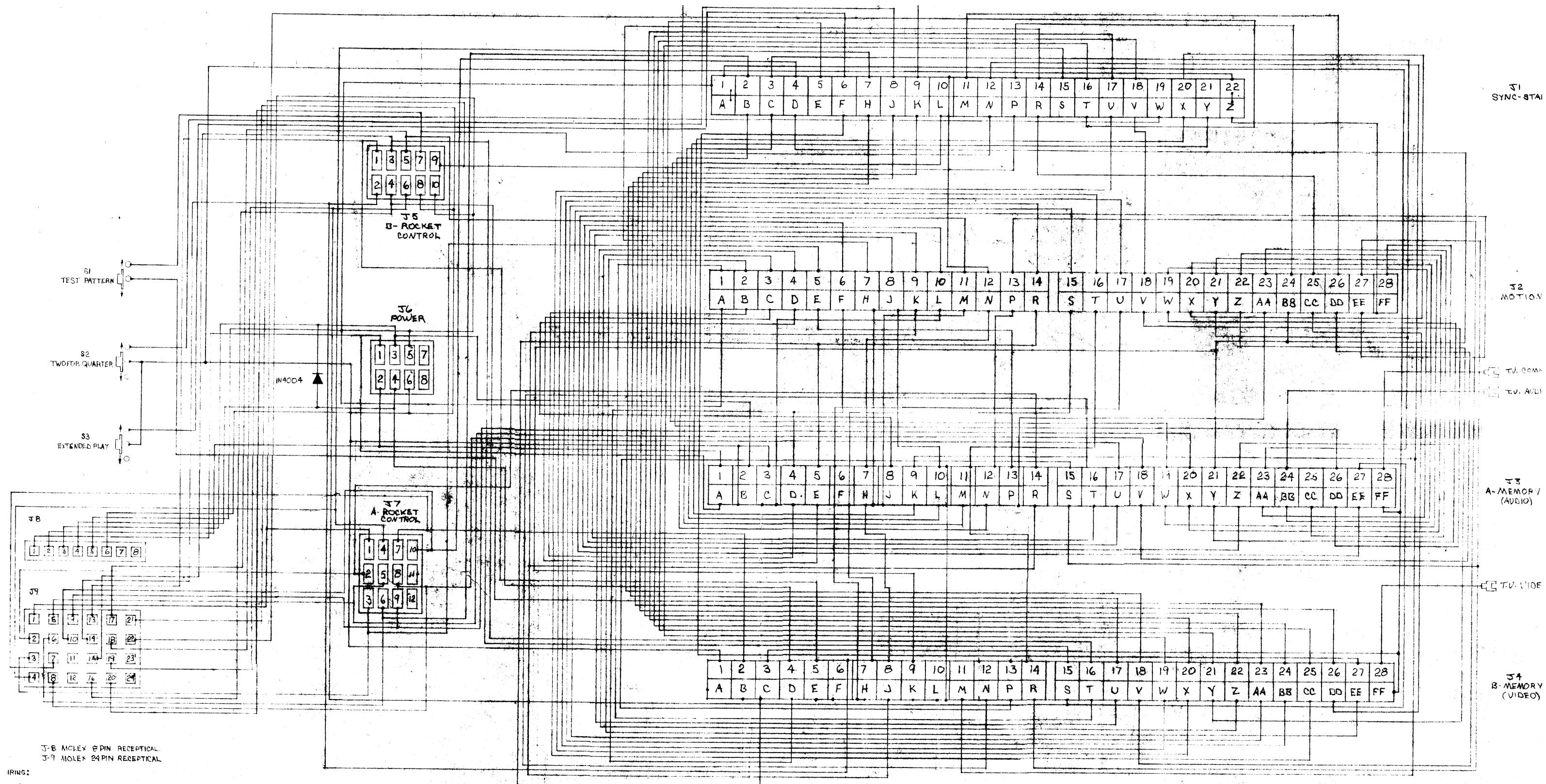
MEMORY BOARD SINGLE-PLAYER
COMPUTER SPACE

FRONT PANEL



TWO-PLAYER COMPUTER SPACE
CHASSIS WIRING

DRAWN BY: WALTER ANDERSON 5/1/73
NUTTING ASSOC. INC.
MT. VIEW, CA 94030



J-8 MOLEX 8 PIN RECEPTICAL
J-9 MOLEX 24 PIN RECEPTICAL

IRING:

J8 PIN

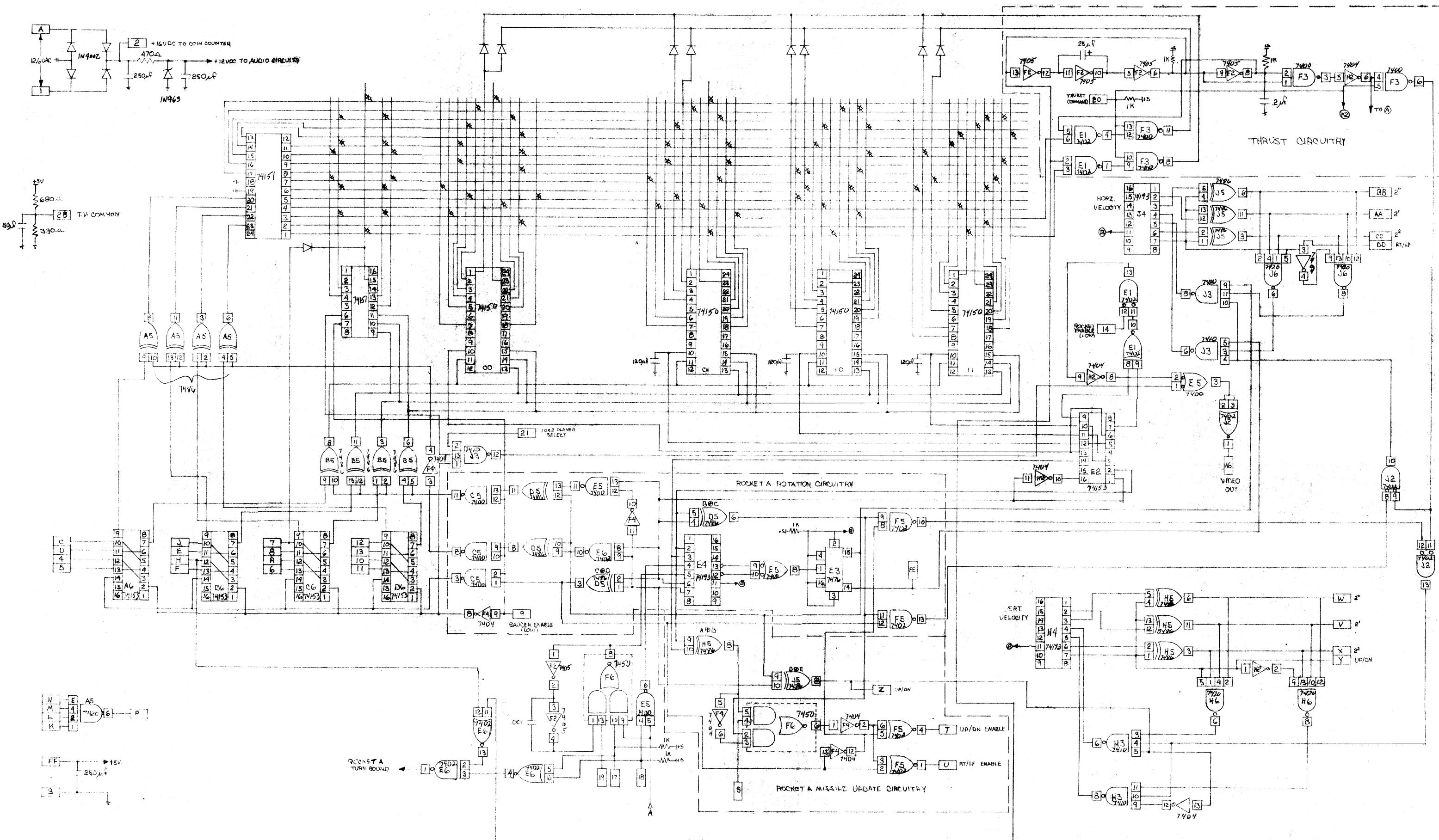
- 1- BLACK 22 GAUGE
- 2- BLACK 22 GAUGE
- 3- BROWN 22 GAUGE
- 4- BROWN 22 GAUGE
- 5- RED 22 GAUGE
- 6- WHITE 18 GAUGE
- 7- N.C.
- 8- N.C.

J9 PIN

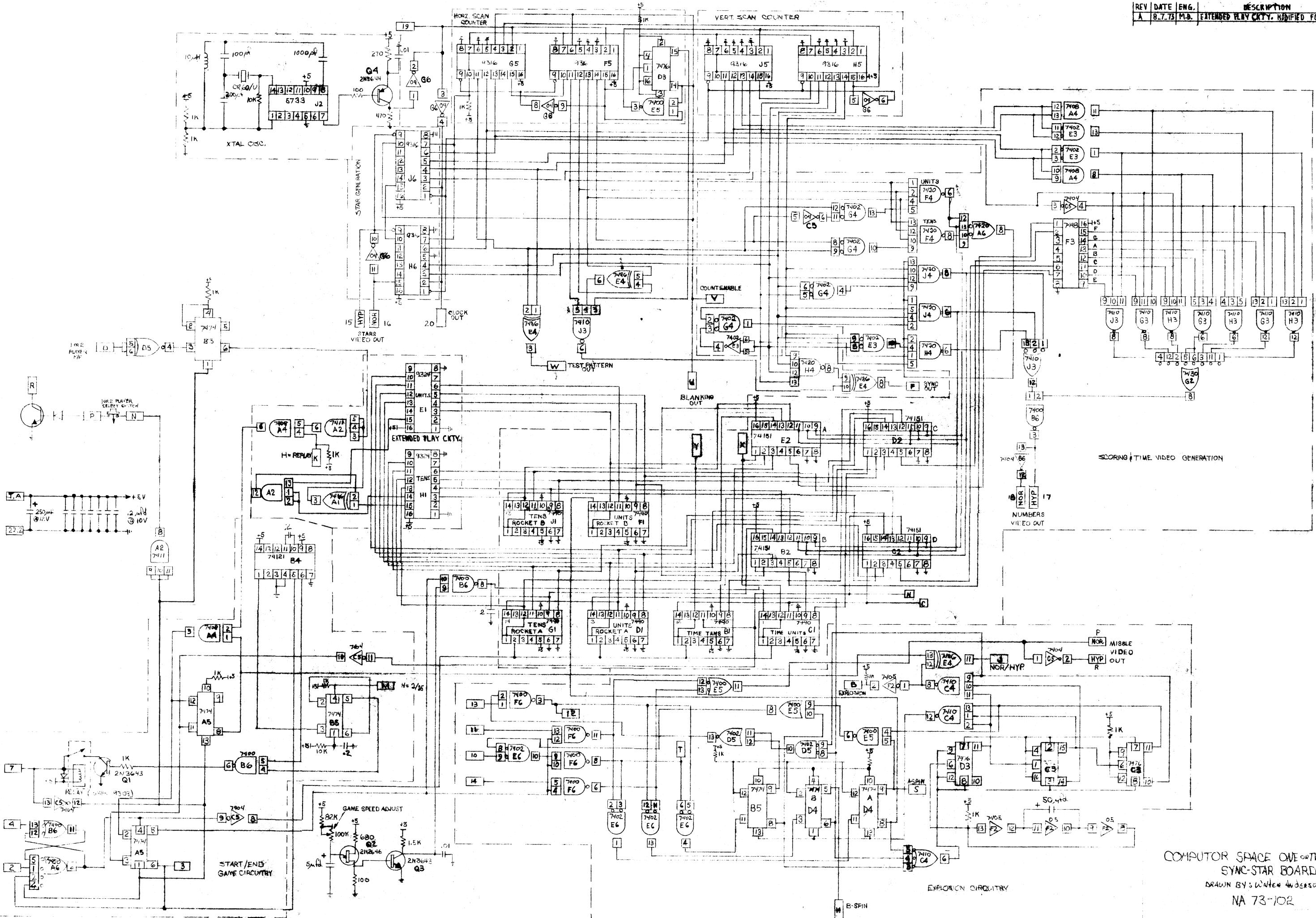
- 1- BLU/WHT 22 GAUGE
- 2- OR/WHT 22 GAUGE
- 3- YL/WHT 22 GAUGE
- 4- VIC/WHT 22 GAUGE
- 5- GRN/WHT 22 GAUGE
- 6- BLX/WHT 22 GAUGE
- 7- BLU 22 GAUGE
- 8- YL 22 GAUGE
- 9- OR 22 GAUGE
- 10- BLW/WHT 22 GAUGE
- 11- N.C.
- 12- N.C.
- 13- OR/WHT 22 GAUGE
- 14- YL/WHT 22 GAUGE
- 15- VIC/WHT 22 GAUGE
- 16- GRY/WHT 22 GAUGE
- 17- RED 22 GAUGE
- 18- WHT 22 GAUGE
- 19- OR 22 GAUGE
- 20- GRN/WHT 22 GAUGE
- 21- BLU 22 GAUGE
- 22- BLW/WHT 22 GAUGE
- 23- N.C.
- 24- N.C.

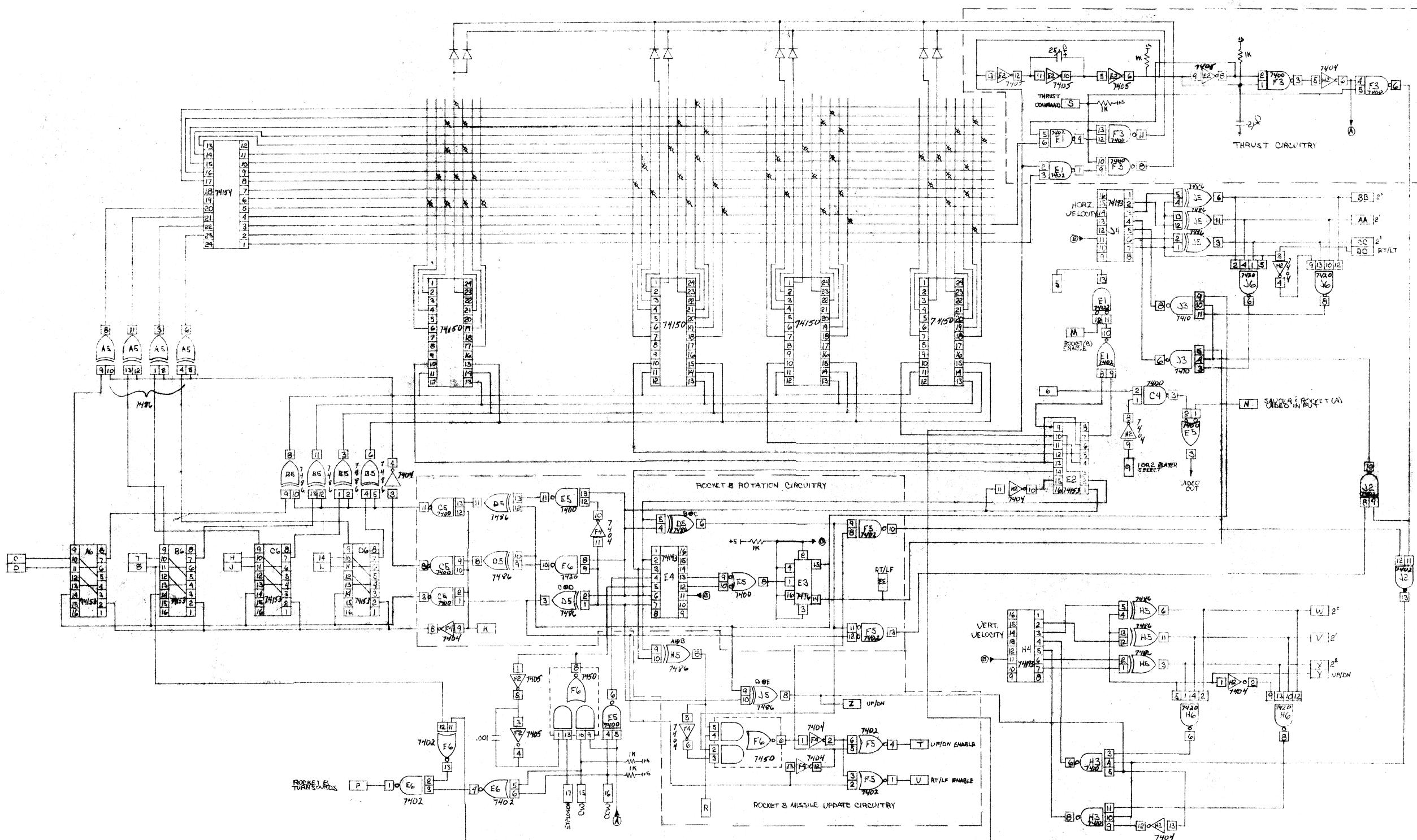
BRAIN BOX WIRING DIAGRAM - TWO PLAYER COMPUTER SPACE
DRAWN BY WALTER ANDERSON 1/29/72

NA 73-124



A-MEMORY BOARD (AUDIO) NA 73-100
1 OR 2 PLAYER COMPUTER SPACE
DRAWN BY: WALTER ANDERSON 1/36/73

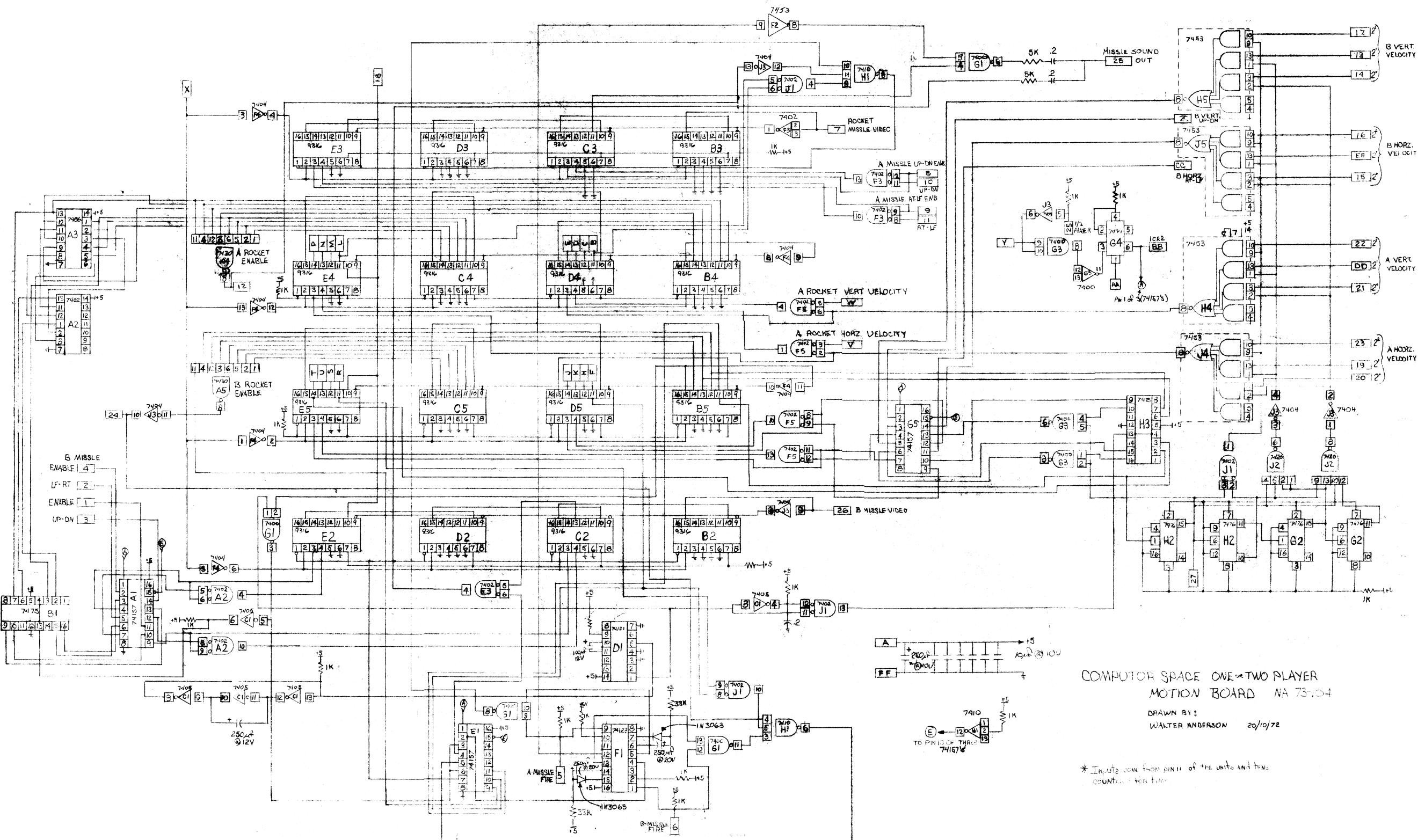




B-MEMORY 1OR2 PLAYER NA 73-103

COMPUTER SPACE

DRAWN BY: WALTER ANDERSON 1/29/22



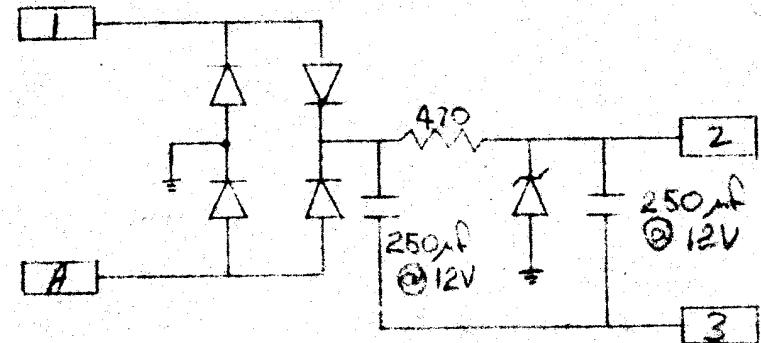
COMPUTOR SPACE ONE & TWO PLAYER
MOTION BOARD NA 73-104

DRAWN BY:
WALTER ANDERSON 20/10/72

* Inputs come from **pink** of the units and tens counter & fraction.

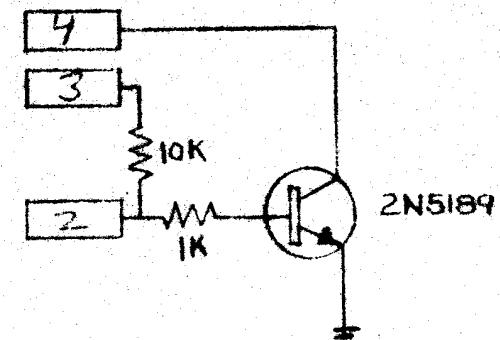
A - ME MEMORY - 2 PLAYER

BRIDGE DIODES - IN4002
ZENER - IN963

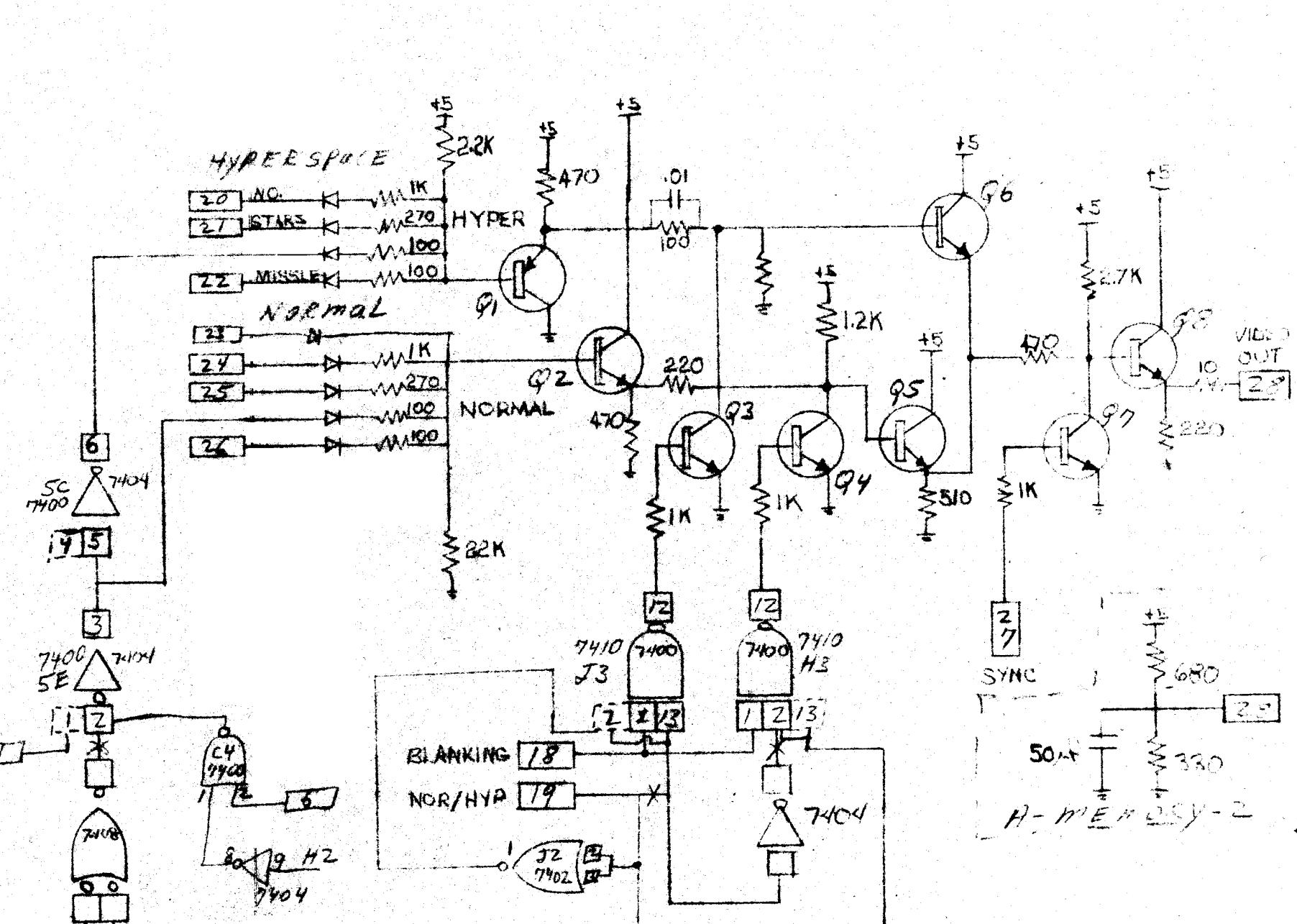


12VDC POWER SUPPLY

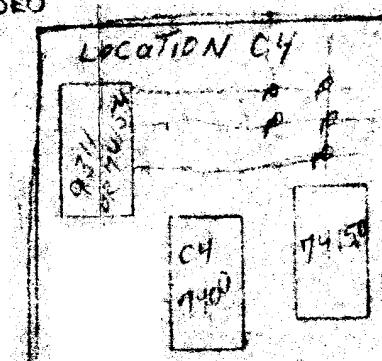
B - ME MEMORY - 2 PLAYER



COIN
COUNTER



B-ROCKET
VIDEOS



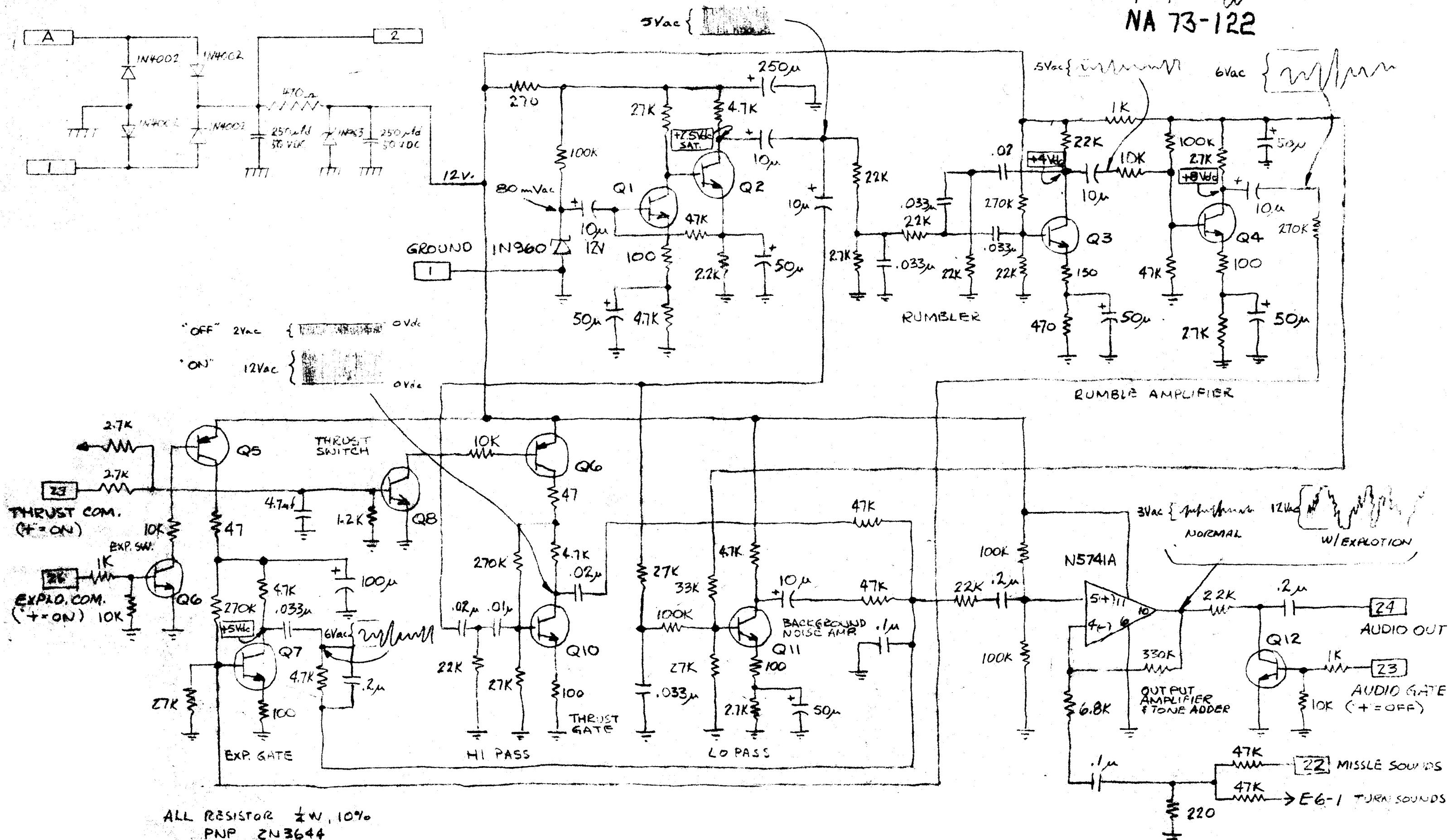
VIDEO AMPLIFIER B-ME MEMORY - 2 PLAYER
NA 73-121 (PART OF 2-PLAYER SYNC RD.)
was

NOTE: THIS DWG IS PART OF A-MEMORY BOARD (2-PLAYER C.5.)

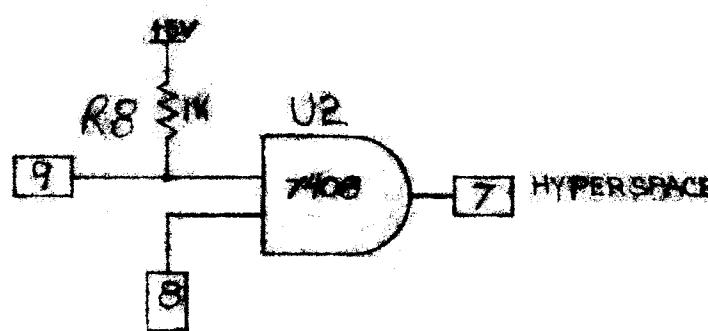
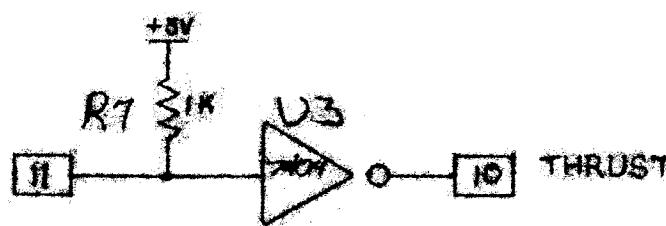
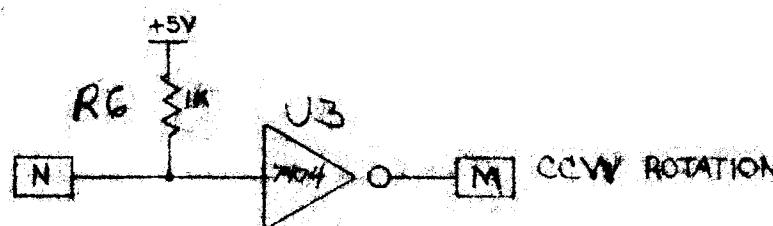
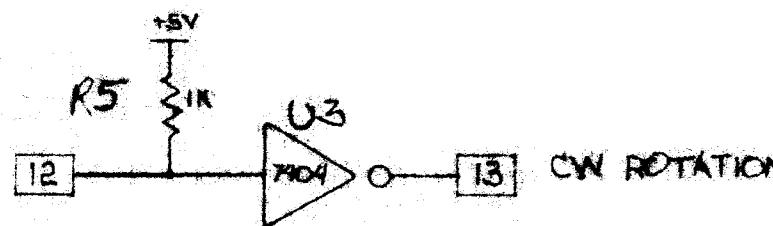
COMPUTER SPACE SOUND CIRCUITS
A-MEMORY BOARD (2-PLAYER C5)

10/27/71 8/3/73 UPDATED K7

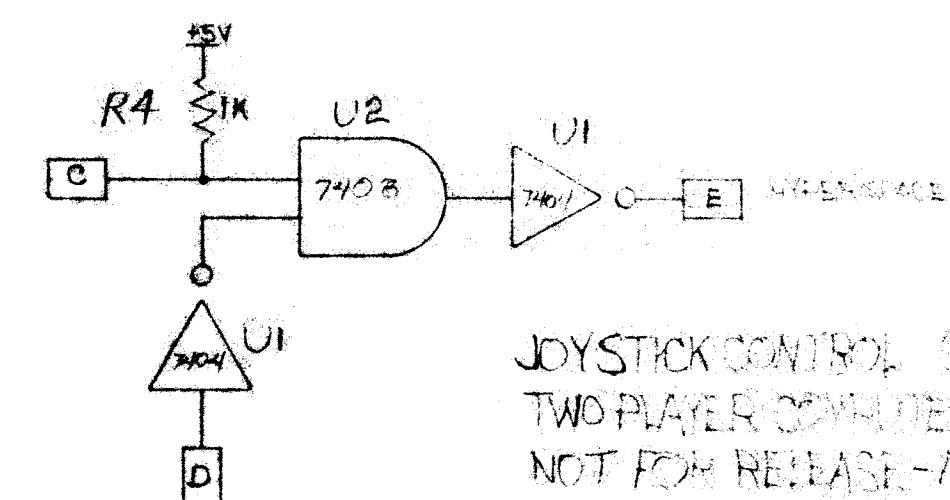
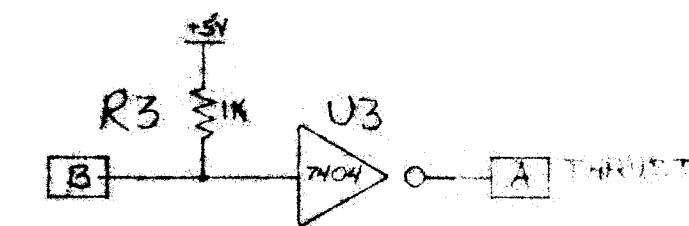
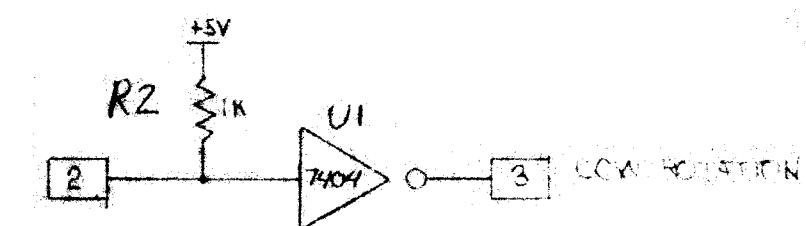
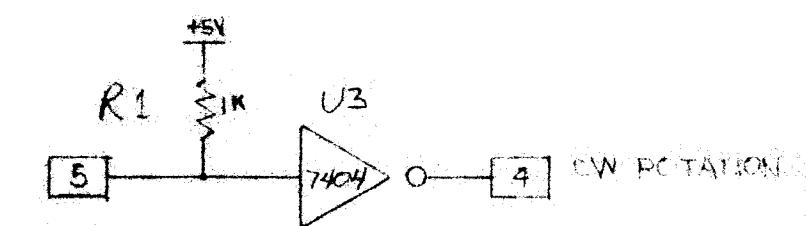
NA 73-122



PLAYER TWO



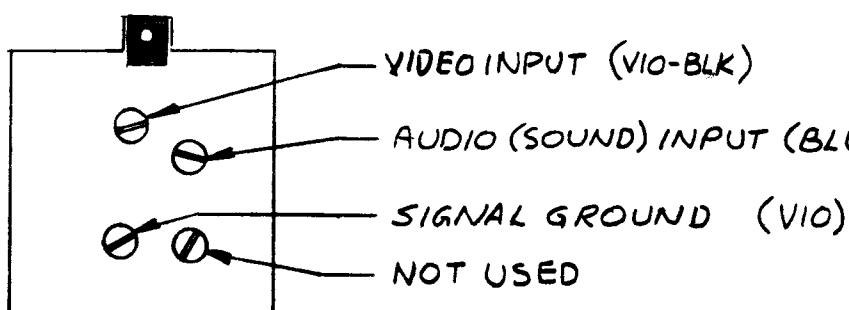
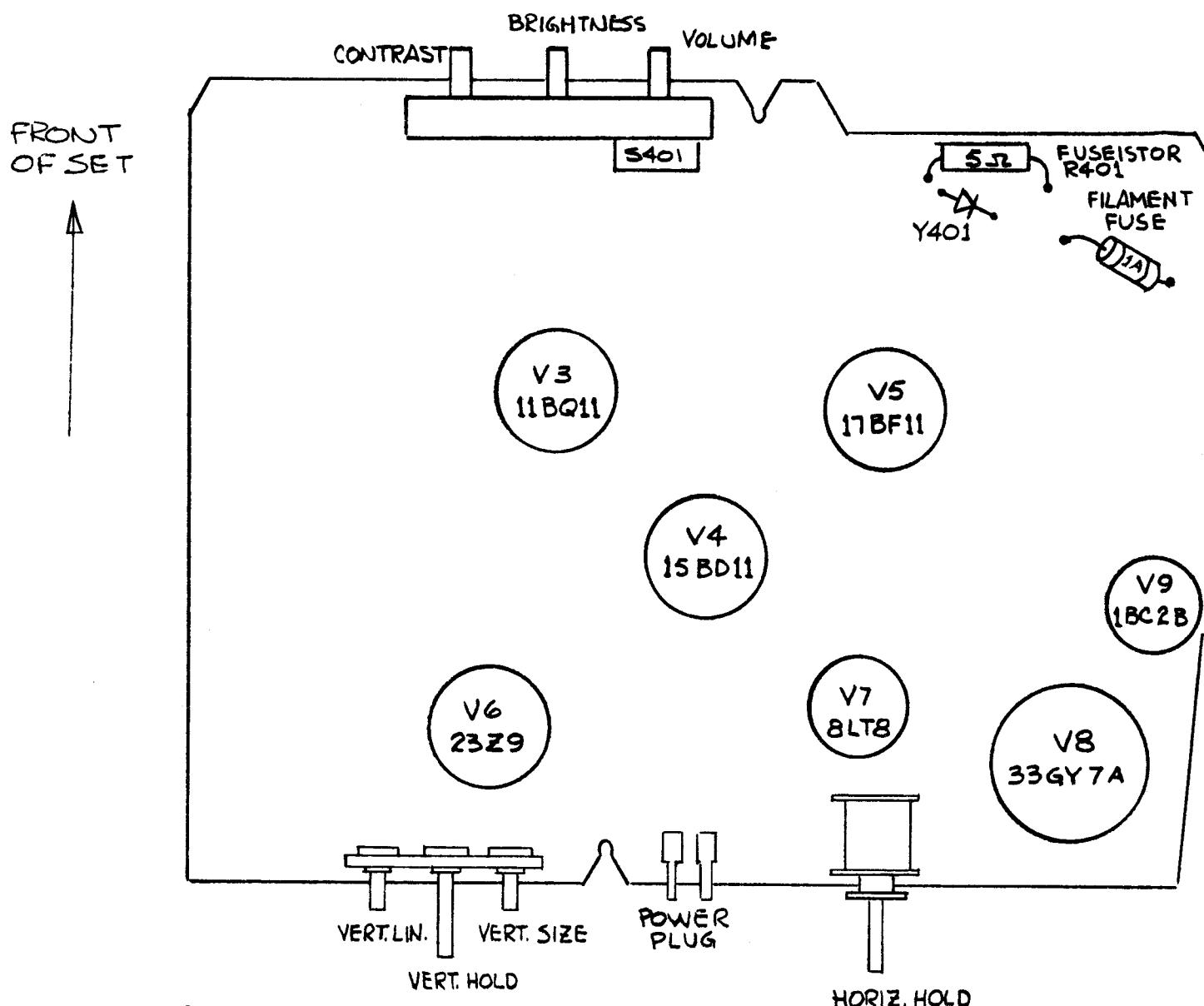
PLAYER ONE



NA 73-126

JOYSTICK CONTROL SERIES B
TWO PLAYER COMPUTER SPACE
NOT FOR RELEASE - NOT IN USE
USE ONLY
DRAWN BY: J. S. JONES
NOT IN USE - 2/10
FOR VIEW DATA 40

→ CAUTION: UNPLUG POWER AND DISCHARGE HIGH VOLTAGE ON
PICTURE TUBE BEFORE SERVICING!



SYMPTOM

1. NO VIDEO PICTURE OR POOR CONTRAST
SOUND AND BRIGHTNESS WORK PROPERLY
2. NO SOUND OR LOW DISTORTED SOUND
3. NO VERTICAL DEFLECTION
(BRIGHT HORIZONTAL LINE ACROSS SCREEN)
4. NO PICTURE OR BRIGHTNESS
SOUND WORKS PROPERLY
5. NO PICTURE, BRIGHTNESS OR SOUND
 - a. IF FILAMENTS ARE LIT :
(IF ONE FILAMENT IS LIT THAN ALL
FILAMENTS ARE WORKING PROPERLY)
 - b. IF FILAMENTS DO NOT LIGHT :

PROBABLE CAUSE

V4
CONTRAST TURNED DOWN

V5
VOLUME TURED DOWN

V6

IN ORDER OF MOST
LIKELY:

V8, V7, V6.

LEAST LIKELY, BUT

POSSIBLE:
V9, PICTURE TUBE

OPEN FUSISTOR
(R401 552)

OPEN RECTIFIER
(Y401)

BLOWN FILAMENT FUSE

OPEN TUBE FILAN (ENR 1971)

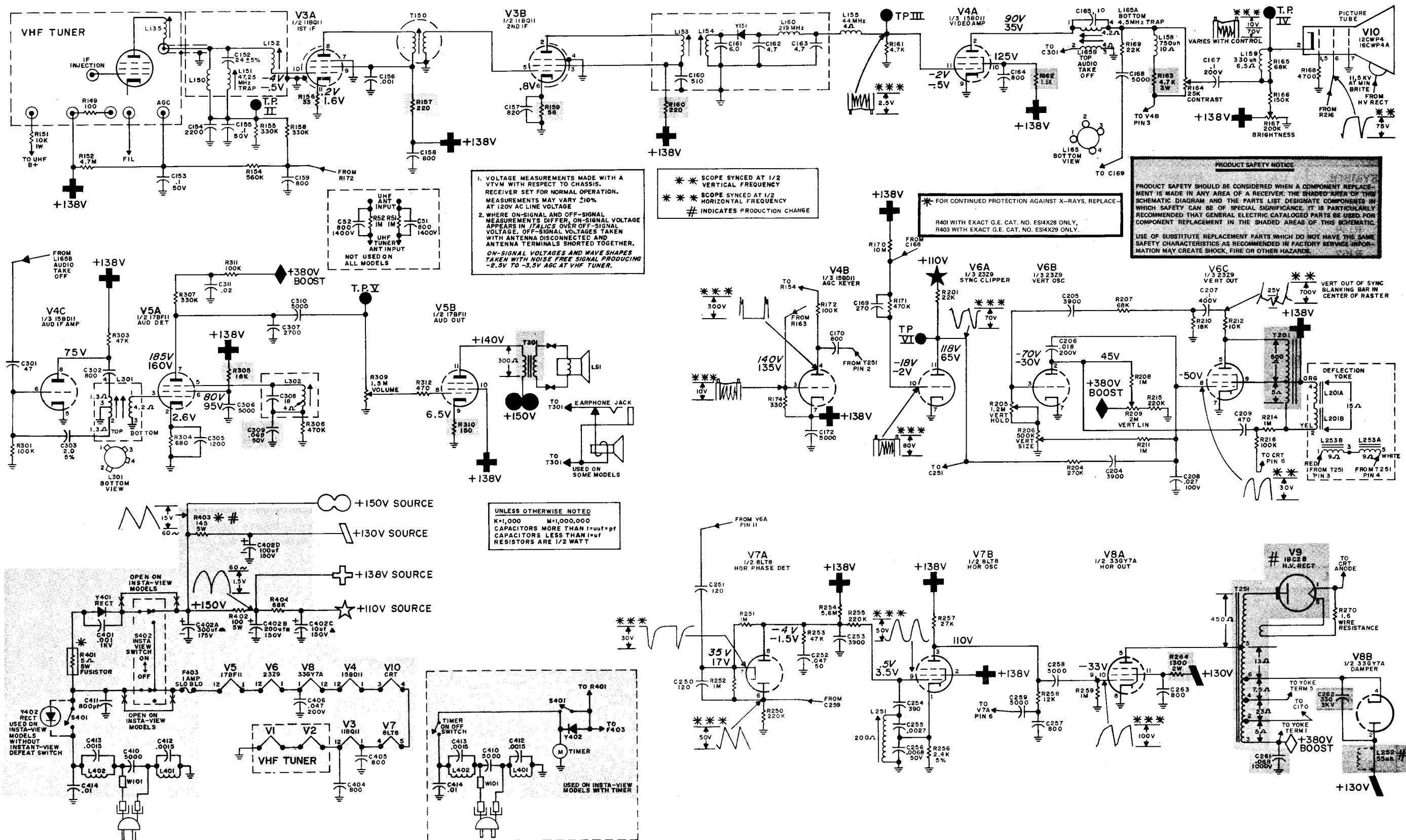
(EXCEPT V9)

POWER PLUG

TROUBLESHOOTING GUIDE

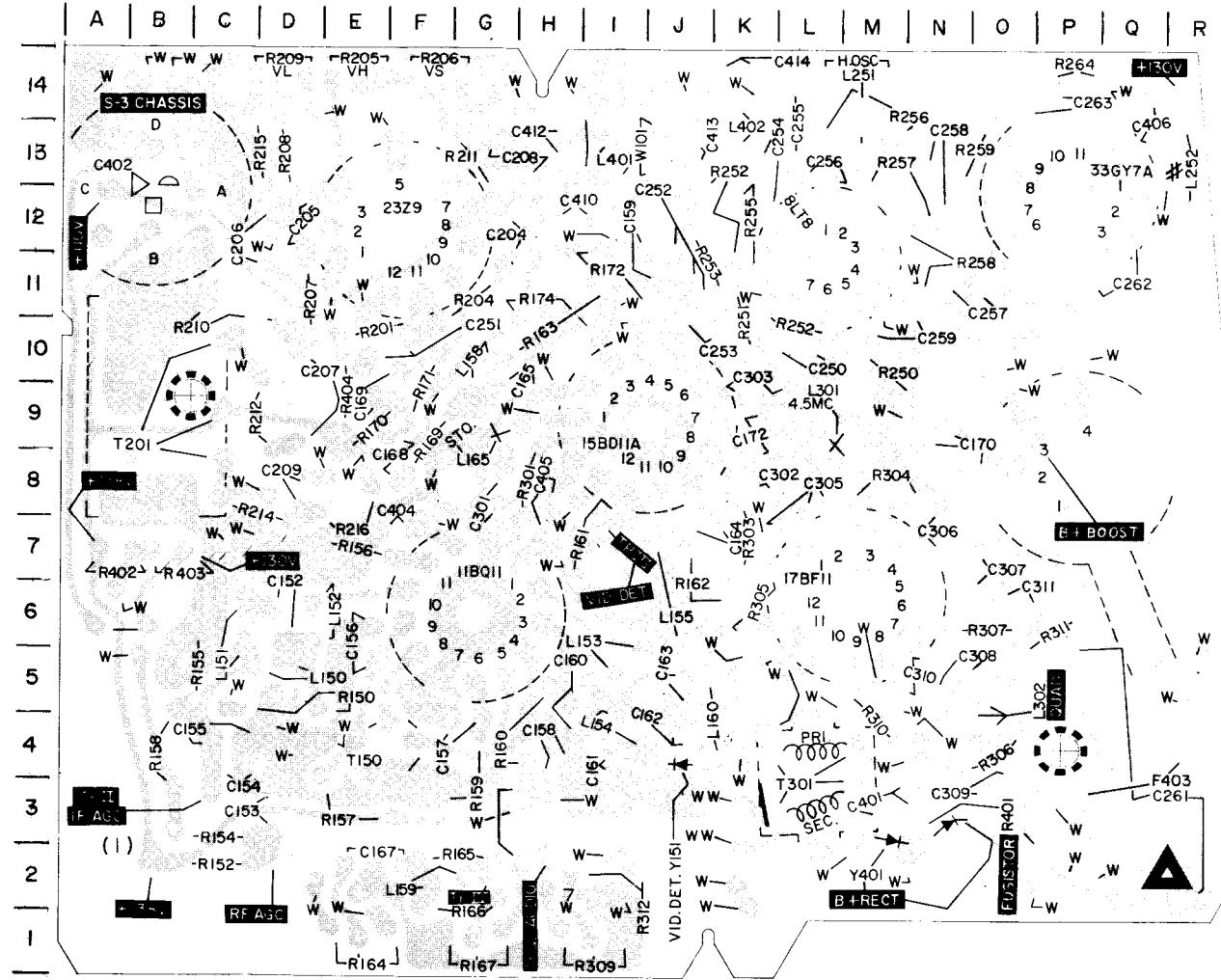
COMPUTER SPACE DISPLAY

1/4/72 *SD* Albany -



MAIN CHASSIS SCHEMATIC DIAGRAM

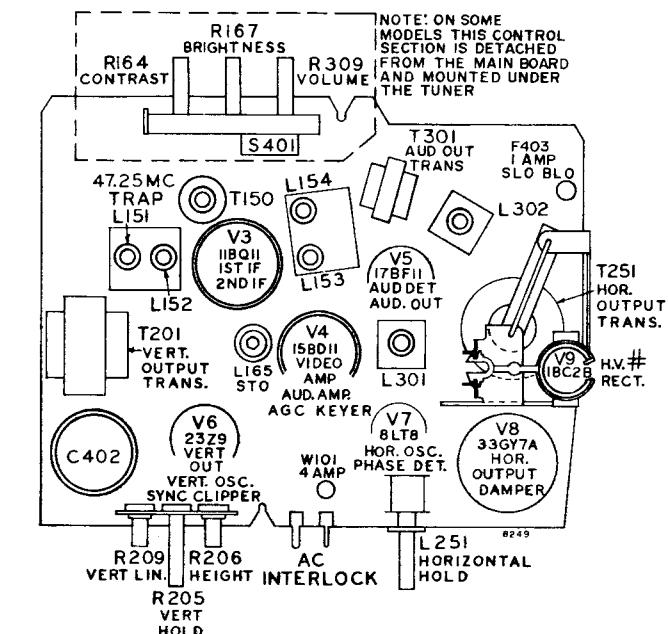
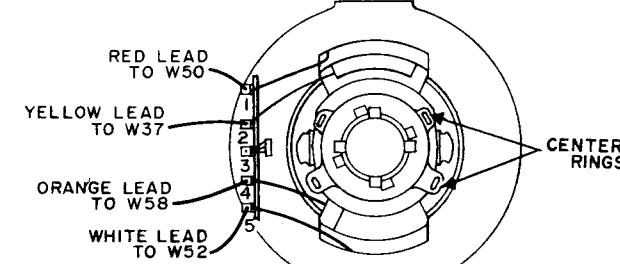
S-3-CHASSIS



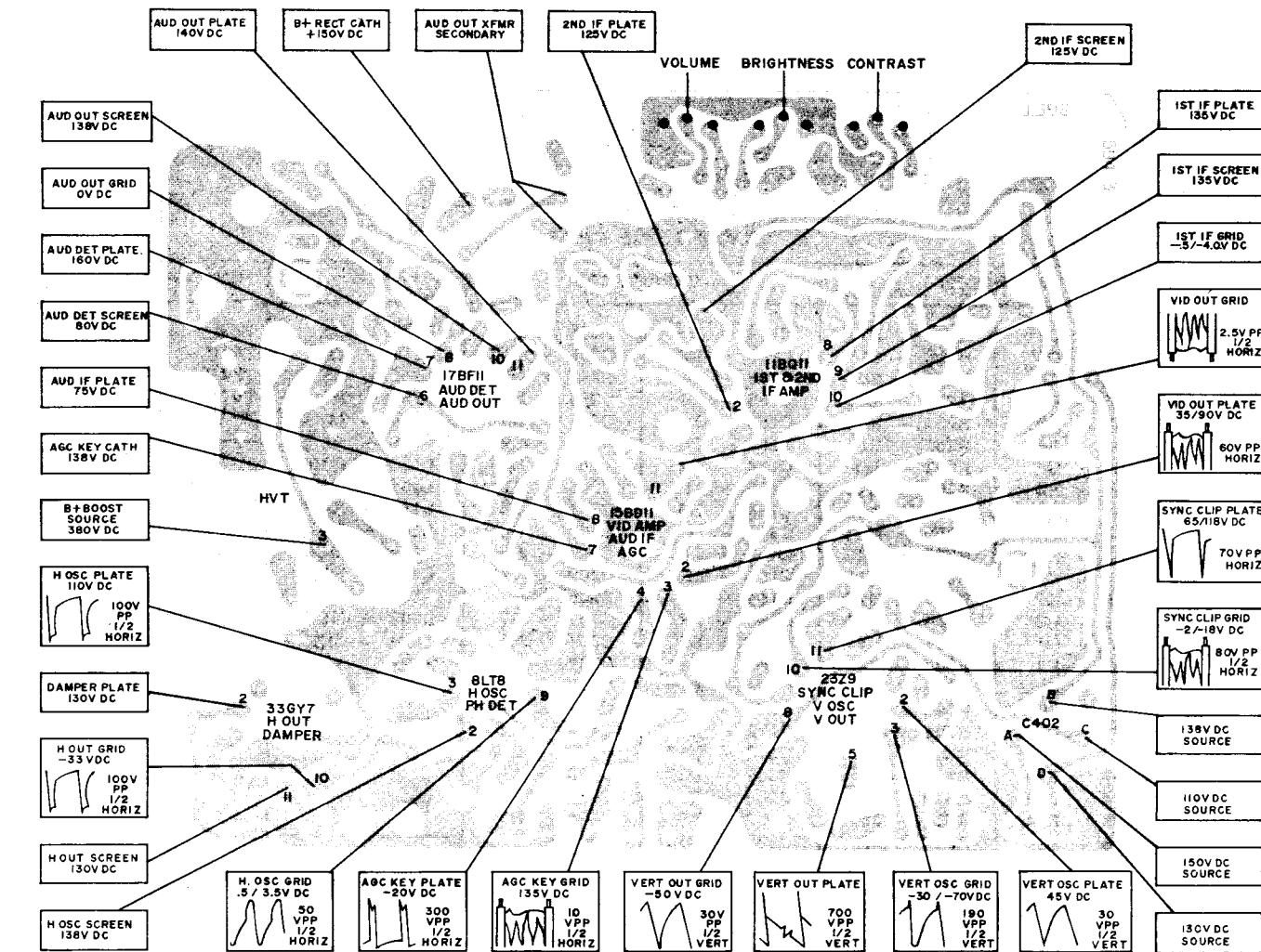
COPPER SIDE VIEW

RESISTORS		CAPACITORS		COILS		TEST POINTS	
R152	C2	R214	D7	C152	D6	C255	L13
R154	C3	R215	D13	C153	D3	C256	L13
R155	C5	R216	E8	C154	C4	C257	N11
R156	E7	R250	M10	C155	C4	C258	N12
R157	E3	R251	K11	C156	E6	C259	M10
R158	B4	R252	L10	C157	G4	C261	Q4
R159	G4	R253	J12	C158	H4	C262	Q11
R160	H4	R254	K12	C159	J11	C263	P14
R161	I7	R255	K12	C160	H4	C301	G8
R162	J7	R256	M13	C161	I4	C302	K8
R163	H10	R257	M12	C162	J4	C303	K9
R164	E1	R258	N11	C163	J5	C305	L7
R165	G2	R259	O13	C164	J7	C306	N7
R166	G2	R264	Q14	C165	H9	C307	O7
R167	G1	R301	H8	C166	E2	C308	N5
R169	F9	R303	K7	C168	F8	C309	O3
R170	E9	R304	M8	C169	F10	C310	N5
R171	F9	R305	K6	C170	N9	C311	O6
R172	I11	R306	O4	C172	K9	C401	N3
R174	H10	R307	O6	C204	G12	C402	B12
R201	E10	R309	I1	C205	D12	C403	A14
R204	G11	R310	M4	C206	D12	C404	F7
R205	E14	R311	P6	C207	D9	C405	H7
R206	F14	R312	J2	C208	G13	C406	Q14
R207	D11	R401	O2	C209	D8	C410	I14
R208	D13	R402	B7	C250	L10	C412	H13
R209	D14	R403	B7	C251	F10	C413	J13
R210	C11	R404	E9	C252	J11	T150	F4
R211	G13			C253	J10	T201	C9
R212	D9			C254	K13	T251	P8
						C414	L14
						T301	L3

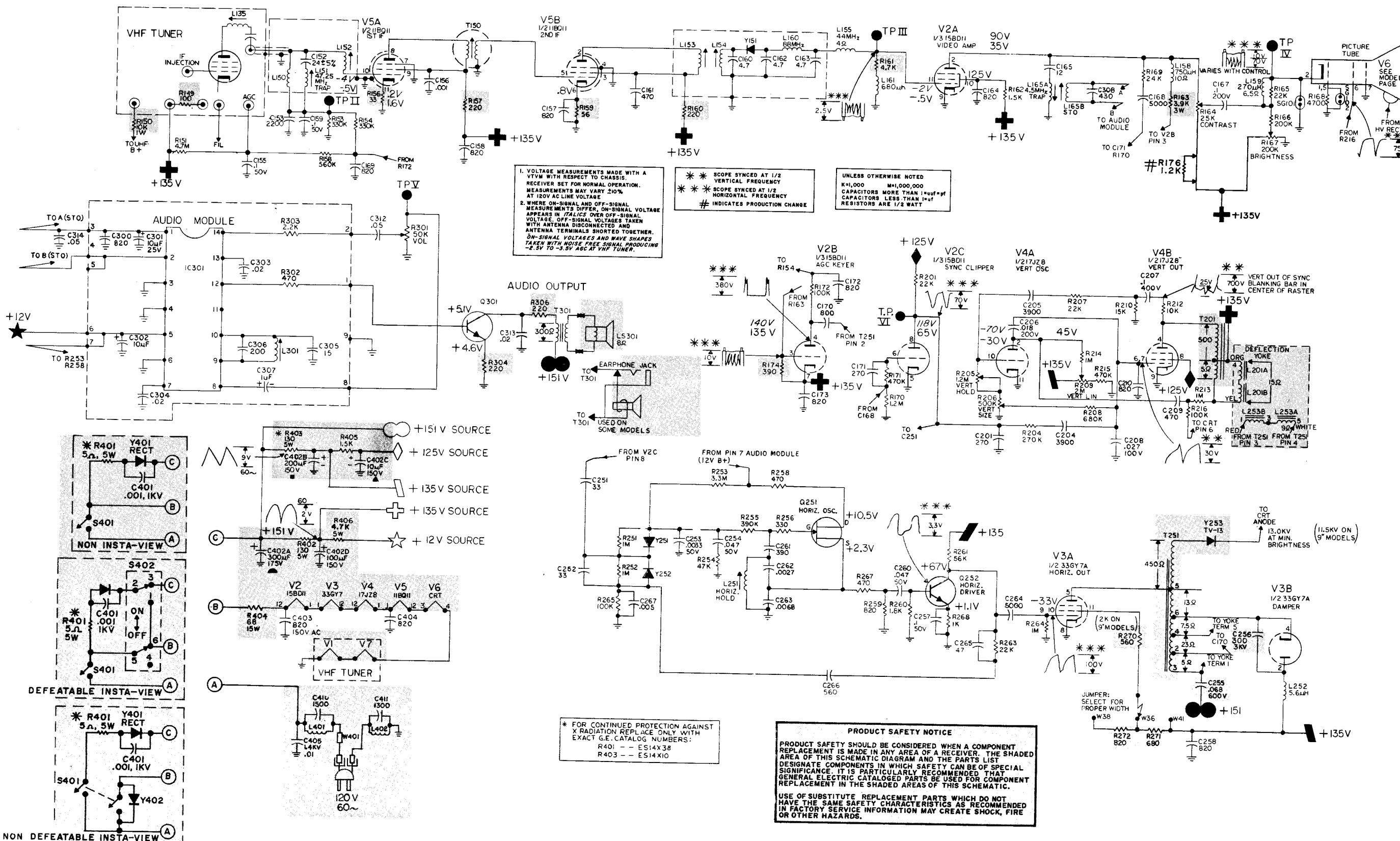
S-3 CHASSIS



YODE ASSEMBLY WIRING



TROUBLESHOOTING GUIDE - BOTTOM VIEW OF CIRCUIT BOARD



PRODUCT SAFETY NOTICE

PRODUCT SAFETY SHOULD BE CONSIDERED WHEN A COMPONENT REPLACEMENT IS MADE IN ANY AREA OF A RECEIVER. THE SHADED AREAS OF THIS PARTS LIST AND THE SCHEMATIC DIAGRAM DESIGNATE COMPONENTS IN WHICH SAFETY CAN BE OF SPECIAL SIGNIFICANCE. IT IS PARTICULARLY RECOMMENDED THAT GENERAL ELECTRIC CATALOGED PARTS BE USED FOR COMPONENT REPLACEMENT IN THE SHADED AREAS OF THIS PARTS LIST.

USE OF SUBSTITUTE REPLACEMENT PARTS WHICH DO NOT HAVE THE SAME SAFETY CHARACTERISTICS AS RECOMMENDED IN FACTORY SERVICE INFORMATION MAY CREATE SHOCK, FIRE OR OTHER HAZARDS.

COMMON RESISTORS

CARBON RESISTORS, 1/2 WATT, 5% UNLESS NOTED

No deviations from resistance and wattage values may be made for replacement items in shaded areas.

SYMBOL	VALUE	SYMBOL	VALUE
R149	100, 1/2W, 10%	R213	1M, 10%
R150	10K, 1W	R214	1M, 10%
R151	4.7M, 10%	R215	470K, 10%
R153	330K	R216	100K
R154	330K	R251	1M, 10%
R156	33	R252	1M, 10%
R157	220	R253	3.3M, 10%
R158	560K, 10%	R254	47K
R159	56	R255	390K, 10%
R160	220	R256	330
R161	4.7K	R258	470
R162	1.5K	R259	820
R165	22K	R260	1.8K, 10%
R166	200K	R261	56K, 10%
R168	4.7K	R263	22K
R169	24K	R264	1M, 10%
R170	1.2M, 10%	R265	100K
R171	470K	R267	470
R172	100K	R268	1K
R174	390	R270	560 (12&15" Models)
# R176	1.2K, 1/4W, 10%	R270	2K (9" Models)
R201	22K	R271	680
R204	270K	R272	820
R207	22K	R304	220
R208	680K, 10%	R306	220
R210	15K, 10%	R405	1.5K
R212	18K, 10%		

SPECIAL RESISTORS

CAT. NO.	SYMBOL	DESCRIPTION
ES14X37	R163	3.9K, 10%, 3W, Wirewound
* ES14X38	R401	5 Ohms, 10%, 10W, Wirewound
ES14X10	R402	130 Ohms, 5%, 5W, Wirewound
* ES14X10	R403	130 Ohms, 5%, 5W, Wirewound
ES14X42	R404	68 Ohms, 15W, 5%
ES14X43	R406	4.7K, 5W, 10%

POTENTIOMETERS

CAT. NO.	SYMBOL	DESCRIPTION
ES49X2	R205	Vert. Hold - 1.2m, 30%
	R206	Vert. Height - 500K, 20%
	R209	Vert. Lin. - 2m, 30%

CAPACITORS (CONT'D)

CAT. NO.	SYMBOL	DESCRIPTION
ES18X59	C403	820pf, 20%, 150VAC
EP18X16	C404	820pf, 20%
ES22X4	C405	.01uf, 150V
EP18X37	C410	1500pf
ES18X60	C411	1300pf, 20%

COILS AND TRANSFORMERS

CAT. NO.	SYMBOL	DESCRIPTION
ES76X48		Yoke
ES36X115	L150	Coil, Link Shunt
ES36X117	L151	47.25mc, Trap
ES36X754	L152	Coil
ES36X757	L153	Coil
ES36X116	L154	Coil
EP36X7	L155	Choke, 44mc
EU36X376	L158	Choke, 750uh, 7%, Peaking
ES36X118	L159	Choke, 270uh, 7%, Peaking
ES36X61	L160	Choke, 10uh, +20%
EP36X19	L161	Choke, 680uh, Peaking
ES36X119	L165	Coil—Sound Take Off
ET35X51	L251	Horiz. Osc.
EU36X536	L252	Choke, 5.6uh, 10%
ES36X28	L401	Choke
ES36X28	L402	Choke
ES36X23	T150	TRANSFORMER—Video IF
ES64X6	T201	Transformer—Vert. Output
ES77X16	T251	Transformer—HVT (12&15" Models)
ES77X17	T251	Transformer—HVT (9" Models)
ES64X13	T301	Transformer—Audio Output

CAPACITORS
DISC CERAMIC, 10% 500V, UNLESS NOTED

CAT. NO.	SYMBOL	DESCRIPTION
ET18X123	C152	24pf, 5%
EP18X21	C153	2200pf
EP25X29	C155	.1uf, 20%, 50V
EU22X117	C156	1000pf, SSHK
EP18X16	C157	820pf, 20%
EP18X16	C158	820pf, 20%
EP25X29	C159	.1uf, 20%, 50V
ES18X501	C160	4.7pf
EU22X90	C161	470pf, SSHK
	C162	4.7pf
	C163	4.7pf
	C164	820pf, 20%
EP18X63	C165	12pf
	C167	.1uf, 20%, 200V
	C168	5000pf
EP18X16	C169	820pf, 20%
EP18X16	C170	820pf, 20%
ET18X598	C171	270pf, N750
	C201	270pf, N750
	C204	3900pf
	C205	.0039uf
ES25X25	C206	.018uf, 200V
	C207	.1uf, 400V
ES20X3	C208	.027uf, 100V
EP18X11	C209	470pf
	C210	820pf, 20%
	C251	33pf, 5%
	C252	33pf, 5%
EP16X3	Y151	Diode—Germanium
ES16X27	Y251	Diode—Silicon
ES16X30	Y252	Diode—Silicon
ES57X21	Y253	HV Rect., w/Anode Clip
ES57X1	Y401	DIODE—LV Rect., Silicon

ELECTROLYTIC CAPACITORS

TRANSISTORS

CAT. NO.	SYMBOL	DESCRIPTION
ES15X92	Q251	Transistor—NPN, Silicon
ES15X93	Q252	Transistor—NPN, Silicon
EP15X16	Q301	Transistor—PNP, Silicon

DIODES

CAT. NO.	SYMBOL	DESCRIPTION
ES12X137		CORE—HV
EP10X52		FUSE—4 Amp, 250V, Fast Blo, W401
ES75X1		MODULE—Audio
ES8X6		PLUG—Phone Type, To Tuner
ES69X10		SHAFT—Horiz. Hold Control
ES41X4		SPARK GAP—1500V, SG102
ES34X14		SOCKET—Right & Left Module
ES34X19		SOCKET—V2, V5
EU34X116		SOCKET—V3, V4
ES34X37		SOCKET—7 Pin, CRT
ES3X7		SPACER—Coil
ES8X123		TERMINAL—Interlock, Small
ES8X124		TERMINAL—Interlock, Large

NOTE: For Cabinet, Appearance, and Front Control parts list see model pages (section 1).

#PRODUCTION CHANGES

For Tuner parts list see tuner pages (section 2).

1. Voltage Dependent Resistor, ES13X3, used in Audio Output stage of early production receivers.
2. R176 added to receivers with serial numbers 5Z30---- and higher.

* FOR CONTINUED PROTECTION AGAINST X-RADIATION
REPLACE ONLY WITH EXACT G.E. CATALOG NUMBERS:
R401--ES14X38
R403--ES14X10